Rationales for Animal Species Considered for Species of Conservation Concern

Sequoia National Forest

Prepared by:
Wildlife Biologists and Biologist Planner
Regional Office, Sequoia National Forest and Washington Office Enterprise Program

For:
Sequoia National Forest

June 2019

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Introduction

A species of conservation concern is a species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area (36 CFR 219.9). The definition of SCC is found at 36 CFR 219.9(c), and criteria for identifying them are outlined in the Forest Service Handbook FSH 1909.12 Chapter 10, Section 12.52c. In coordination with the Sequoia National Forest, and pursuant to responsibilities and authority under the 2012 Planning Rule (36 CFR 219.7(c)(3)), the Regional Forester determined the terrestrial wildlife, aquatic wildlife, and plant species meeting the criteria for species of conservation concern (SCC) for revision of the Sequoia National Forests' Land Management Plan and Revised Draft Environment Impact Statement (FEIS) (Moore 2019). This document presents the rationales of animal species considered for species of conservation concern.

Species of Conservation Concern Compared to Forest Service Sensitive Species

During the evaluation of species of conservation concern, over 70 terrestrial and aquatic animal species were considered, including consideration of all species on the Region 5 Regional Forester's sensitive species list for the Sequoia National Forest. The Regional Forester's sensitive species list of wildlife, fish, and invertebrate sensitive species on the Sequoia National Forest are based on the September 9, 2013 versions of the USDA Forest Service Pacific Southwest Region Sensitive Animal and Plant Species by Forest[1]. In general, sensitive species were determined not to meet the established criteria as a species of conservation concern for one or more of the following reasons:

- It is a federally recognized threatened, endangered, proposed, or candidate species under the Endangered Species Act and would be considered under that other category of at-risk species.
- The species does not have a known occurrence on the national forest.
- Previous occurrence records were determined to be incorrect identifications of the species and/or could not be re-located.
- Recent surveys indicated the species is more common than originally thought.
- Natureserve, California Natural Diversity Database, California Native Plant Society Rare plant inventory, or other best available scientific information or data sources indicate threats to the species were not substantial.
- There was no information about threats to the species. This was a relatively uncommon circumstance, because information about threats could be inferred from threats to the ecosystems upon which the species depend. Lack of information generally only limited species inclusion on

[1] https://www.fs.usda.gov/main/r5/plants-animals/wildlife

the list if the species had not been observed for decades or more, leading to uncertainty about the condition of its specific habitat.

The specific reasons a species was determined to meet or not meet the established criteria as a species of conservation concern are provided in the species rationales in chapters 1 and 2.

Procedure for Evaluation of Animal Species of Conservation Concern

Species are evaluated by following a process outlined in national directive FSH 1909.12 § 12.52c-d. Species are considered using databases, scientific studies, local information and expert knowledge. Initially, we included all known or potential species within or near the administrative boundaries of the forest, providing a comprehensive list for evaluation of other criteria. The list was based on a compilation of all California Natural Diversity Database polygons from the February 2016 dataset that intersect the Forest boundaries. Some of the species included from this step were based upon over-estimated delineations of map areas, particularly from the California Natural Diversity Database dataset. Only species with reliable documentation for presence within the plan area were carried forward for further consideration. More recent California Natural Diversity Database datasets, and other datasets like eBird, were reviewed for the updated rationales in this document as referenced.

In addition to research conducted by Forest Service specialists, the national directives require use of threat status rankings, determined in large part through NatureServe, a non-profit organization that provides proprietary wildlife and plant conservation-related data, tools, and services. The conservation status rank of a species is represented by a letter and a number. The letter represents one of two distinct geographic scales: global (G) and state (S). The status rank number is on a scale of one to five, where a ranking of one indicates a species at the highest level of risk and a ranking of five indicates the lowest level of risk. The status rank number is preceded by the letter reflecting the appropriate geographic scale of the assessment. For example, a status rank of G5 represents a species that has an extensive range of distribution and has a low risk of extinction. Infraspecific taxa refer to subspecies, varieties, and other designations below the level of species. The status rank of infraspecific taxa (subspecies or varieties) is indicated by a supplementary T-rank, following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above. For example, the rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1.

We also consider species listed as threatened or endangered by states or federally recognized Tribes, or identified as a high priority for conservation; species petitioned for Federal ESA listing and for which a positive "90-day finding" has been made; and other species as outlined in national directive FSH 1909.12 § 12.52c-d.

If no information on threats or concern for persistence in the planning area was available, the species was determined to have insufficient information available to conclude there is a substantial concern about the species capability to persist in the plan area over the long term, and the species was not carried forward for further consideration.

Note that information in the rationales is often derived from the Final Sierra National Forest Assessment (United States Department of Agriculture 2013) and associated Topic Papers and Living Assessment Chapters, the draft Biological Evaluation (Krueger 2016)), the Draft Environmental Impact Statement for Revision of the Inyo, Sequoia, and Sierra National Forests Land Management Plans (United States Department of Agriculture 2016), and forest-level data, unless otherwise noted. Literature cited in those documents can be found in their respective reference sections.

Sequoia National Forest Species of Conservation Concern

Based on reviews of best available scientific information for all species considered, 26 animal species meet the criteria for listing as species of conservation concern for the Sequoia National Forest (Table 1). Of the 24 animal species on the Regional Forester's 2013 animal sensitive species list on the Sequoia National Forest, 16 met the criteria of species of conservation concern. In addition, 10 species not previously categorized as Region 5 sensitive species are recommended as species of conservation concern.

Table 1. Regional Forester's animal species of conservation concern for the Sequoia National Forest, June 2019

Type	Common Name (Scientific name)
Birds	Bald eagle (*Haliaeetus leucocephalus*) California spotted owl (*Strix occidentalis occidentalis*) Great gray owl (*Strix nebulosa*) Kern red-winged blackbird (*Agelaius phoeniceus aciculatus*) Mount Pinos Sooty grouse (*Dendragapus fuliginosus howardi*) Northern Goshawk (*Accipiter gentilis atricapillus*) Tricolored blackbird (*Agelaius tricolor*) Willow Flycatcher (Empidonax traillii brewsteri and Empidonax traillii adastus)
Mammals	Fringed myotis (*Myotis thysanodes*) Sierra Marten (*Martes caurina sierra*) Townsend's big-eared bat (*Corynorhinus townsendii*)
Amphibians	Fairview slender salamander (*Batrachoseps bramei*) Foothill yellow-legged frog (*Rana boylii*) Kern Canyon slender salamander (*Batrachoseps simatus*) Kern Plateau salamander (*Batrachoseps robustus*) Relictual slender salamander (*Batrachoseps relictus*) Yellow-blotched salamander (*Ensatina eschscholtzii croceator*)
Fish	California golden trout (*Oncorhynchus mykiss aguabonita*) Central Valley hitch (*Lavinia exilicauda exilicauda*) Hardhead (*Mylopharodon conocephalus*) Kern River rainbow trout (*Oncorhynchus mykiss gilberti*)
Terrestrial Invertebrates	Behr's metalmark (*Apodemia virgulti davenporti*) Evius Blue (*Plebejus icarioides evius*) Greenish blue (*Plebejus saepiolus aehaja*) Tehachapi fritillary (*Speyeria egleis tehachapina*)
Aquatic Invertebrates	Western pearlshell (*Margaritifera falcata*)

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Chapter 1 – Rationale for Animal Species Meeting Criteria for Species of Conservation Concern

Birds

Bald eagle - *Haliaeetus leucocephalus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Habitat loss, human disturbance, and energy development.

Rationale for bald eagle

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S3

Other Designations: CA-SGCN; CA-Fully Protected; FS-SS; BLM-SS

The bald eagle has a global ranking of G5, Secure "common; widespread and abundant". The ranking of S3 in California indicates the bald eagle is Vulnerable (NatureServe 2015). The bald eagle was listed as endangered by USFWS on March 11, 1967 and down-listed to Threatened on July 12, 1995. The bald eagle was federally de-listed on August 8, 2007. The bald eagle is currently protected under the Bald and Golden Eagle Protection Act of 1940, and remains listed as endangered in California by the California Department of Fish and Wildlife.

Based on extensive survey data, breeding populations in 1997 were estimated at 142 pairs in California and 2 pairs in Nevada, and wintering populations were estimated at 574 individuals in California and 90 individuals in Nevada (Buehler 2000). The annual Midwinter Bald Eagle Survey from 1986-2010 showed a significant increase in population for the conterminous United States (+0.6%), positive trends in the northeast (+3.9%) and northwest (+1.1%), and a negative trend in the southwest (-2.2%) (Eakle et al. 2015).

Breeding season timing in California varies significantly, generally correlated with elevation, with breeding season beginning earlier in lower elevation areas. Breeding season generally occurs from February through July; but may start as early as November (Zeiner et al. 1990a). Pair initiation begins in January and egg-laying occurs from March through early May. Clutch size is 1 to 4 eggs (Evans 1982, Zeiner et al. 1990a). Incubation is usually 34 to 36 days (Evans 1982, Zeiner et al. 1990a) and fledging occurs at 10 to 12 weeks (Evans 1982). Semi-altricial young hatch asynchronously (Zeiner et al. 1990a). Bald eagles are monogamous, and breed first at 4 to 5 years (Zeiner et al. 1990a).

Bald eagles require open water with abundant food resources with adjacent mature trees or steep cliffs for nesting, perching, foraging, and roosting (Murphy and Knopp 2000). This species typically perches in "large, robustly limbed trees, on snags, on broken topped trees, or on rocks near water" (Peterson 1986, Laves and Romsos 2000). Bald eagles are primarily fish eaters; however, they are opportunistic and will utilize avian and mammalian prey and carrion if readily available, especially in the nonbreeding season (Evans 1982, Zeiner et al. 1990a).

Suitable perch sites directly adjacent to foraging areas are important habitat features as eagles often hunt from perches, swooping down to seize fish from the water. (Evans 1982, Zeiner et al. 1990a). Preferred perch trees are larger in diameter and taller than the dominant tree canopy, particularly trees greater than 100 cm (40 in) diameter at breast height, greater than 30 m (98 ft) tall, and dead topped trees with robust, open branch structures. Perches function as resting, preening, foraging and feeding sites for bald eagles. Ninety six percent of the perch sites (n=23) identified by Laves and Romsos (2000) were located within 0.25 miles of a large, open body of water.

In northern California nest territories are typically within conifer stands with most nests in ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*Pinus jeffreyi*) and sugar pine (*Pinus lambertiana*). Nests are generally within one of the tallest trees in the stand, and the majority of nest trees have an unobstructed view to a water body (Lehman 1979). In California, large diameter trees are used for nesting, with an average of 109 cm, (43 in) DBH (Anthony et al. 1982). Nest trees must be sturdy to support the large, heavy stick nests built by this species. Most bald eagle nests are located within 1.6 km (1 mi) of a large body of water (Lehman 1979, Anthony et al. 1982).

Bald eagles may roost communally in winter in dense, sheltered, remote conifer stands (Zeiner et al. 1990a). Roost trees are perches where one or more bald eagles rest at night and may occur long distances from open water bodies. Roost trees are similar in structure compared to perch trees; "dominant trees that have open and robust branches, are sometimes defoliated (i.e., snags), are protected from prevailing winds, and are typically far from human development" (Anthony et al. 1982). Availability of food resources plays a central role for migrating and wintering eagles, and increases in available prey are highly correlated with bald eagle abundance and habitat use (Restani et al. 2000, Elliott et al. 2011).

The most significant threat to survival of the bald eagle in the 20th century was the widespread use the organochlorine pesticide DDT which interfered with normal calcium metabolism and caused abnormalities in bald eagle eggshells, resulting in widespread nesting failures and population declines. In the decades following the 1972 ban on DDT's agricultural use in the United States, bald eagle populations recovered significantly. There are several remaining threats to bald eagles populations, with the most significant being habitat loss and human disturbance.

Threats to habitat include any source of extensive tree mortality within suitable nesting and perching habitat adjacent to large lakes and rivers that support bald eagle food supplies. High severity fire can eliminate large tree nesting and perching habitat. Extensive tree mortality caused by insects and diseases also remove suitable habitat. Additional threats to habitat include degradation of aquatic habitats that affect fish populations that serve as the bald eagles' primary food source. Exceptional drought conditions can increase tree mortality as well as reduce reservoir levels and prey availability. Climate change could potentially accelerate the rate at which habitat is lost.

A variety of human activities can potentially interfere with bald eagles, affecting their ability to forage, nest, roost, breed, or raise young. Territories have been abandoned after disturbance from logging, recreational developments, and other human activities near nests (Zeiner et al. 1990a).

Bald eagles may not begin nesting if human disturbance is present near nests (Zeiner et al. 1990a). Human recreational activities such as boating, jet-skiing, fishing, and low flying aircraft can cause disturbances to nesting birds, but this species also shows a moderate tolerance for the presence of humans (Buehler 2000). Not all bald eagle pairs react to human activities in the same way. Some pairs nest successfully just yards from human activity, while others abandon nest sites in response to activities much farther away. This variability may be related to a number of factors, including visibility, duration, noise levels, extent of the area affected by the activity, prior experiences with humans, and tolerance of the individual nesting pair.

Human disturbance can also affect foraging activity. Recreational use of lakes and extensive shoreline development have reduced available foraging habitat (Evans 1982). In Washington, bald eagles have been found to be adversely affected by recreation that involves both pedestrian traffic and boat use by adversely affecting feeding activity (Stalmaster and Kaiser 1998). Wintering bald eagles may also be adversely affected by human disturbance and eagle distribution patterns can be significantly changed by human activity (Stalmaster and Newman 1978). Eagles were displaced in areas of high human activity and moved to areas of lower human activity. Flush distances were lower when the disturbance was on land than in the water and lower still if the eagle couldn't see the cause of the disturbance.

The US Fish and Wildlife Service has provided recommendations for reducing disturbance to bald eagles, as well as recommendations for habitat management. The National Bald Eagle Management Guidelines contain recommendations for reducing disturbance at nesting, foraging, and communal roosts from a variety of human activities. These recommendations provide a sound scientific basis for reducing the effects of human disturbance on bald eagles (USFWS 2007).

Additional threats to bald eagles include poisoning (especially lead poisoning), electrocution, collisions with electrical lines, and shooting. Natural predation is restricted to nests and is rare, and diseases and parasites have been observed but apparently contribute little to mortality.

Forest-Specific Rationale

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012 and is included here for reference only.

Information **on current distribution of the species on the planning unit**

There are 63 records of 89 individual bald eagle in the NRIS database, of those records, two were documented as reproducing in 1992 and 2010. In eBird, there are numerous bald eagle sightings along Kern River, north and south and especially in the vicinity of Lake Isabella. South Fork Wildlife Area is a popular wintering site. The most recent sighting was not a nesting pair but rather an adult and juvenile. The most recent observations of bald eagle were in 2017. Recent sightings do not include nesting activity. There are no CNNDB records for bald eagle in the plan area.

Key ecological conditions for this species

Bald eagles utilize large conifer stands (Jeffery pine and mixed conifer) where there is access to open water (e.g. lakes or reservoirs) or free flowing rivers for foraging, typically within one mile of large trees (40 in dbh) and greater than 98 ft. tall, snags, and or dead top trees.

On the Sequoia National Forest, these conditions can be largely found in the Montane Zone-mixed conifer and yellow pine (ponderosa and Jeffrey) forest that dominates the montane zone across most of the forest (46 percent of the assessment area). In addition to these species, incense cedar, and white fir are found.

Additional habitat can be found in the Upper Montane Zone where snow is the primary form of precipitation. This area occurs above mixed conifer and occupies one-quarter of the assessment area. Red fir forests with Jeffrey pine occur on the rockier sites in the northern half of the forest and in the southern half of the forest, red fir is replaced by white fir.

Potential habitat (excluding private land) available to Bald eagle on the Sequoia National Forest, as defined by the CWHR is shown in the table below. There are approximately 124,744 acres of forest containing CWHR size classes > 24 inches (Sequoia Assessment 2013-chapter 1 snapshot).

Table 2. Acres of potential habitat (excluding private land) available to bald eagle on the Sequoia National Forest, as defined by the California Wildlife Habitat Relationships (CWHR)

CWHR Habitat Type	Acres
Montane Hardwood-Conifer	39211
Montane Riparian	5976
Ponderosa Pine	27556
Sierran Mixed Conifer	229423
Jeffrey Pine	50112
White Fir	2853
Total	355,131

Water bodies which support prey for bald eagle are limited. According to the DEIS, The Forest provides reservoir fisheries; high mountain lake fisheries; as well as both warm and cold water fisheries which could provide prey for bald eagle. The Sequoia National Forest has 96 acres of natural lakes and ponds-natural lakes and ponds are rare and the few that do occur on the forest are in wilderness. These include Maggie Lakes, Weaver Lake, Silver Lake and Coyote Lake. However, lower elevation reservoirs such as Lake Isabella provide alternative habitat which could support wildlife like bald eagle. Pine Flat Reservoir on the northern part of the Sequoia National Forest is also used by Bald eagle.

Four major rivers drain parts of the Sequoia National Forest. The Kings, Kaweah, and Tule Rivers flow almost due west through deep canyons in the northwestern portion of the Greenhorn Mountains. Several smaller watersheds such as Deer Creek or White Creek flank the western side of the Greenhorn Mountains. On the southern portion of the forest, below Lake Isabella reservoir, the Kern River separates the Breckenridge Mountains from the Greenhorn Mountains. The Kern River drains the southern and eastern portions of the Greenhorns and is impounded at Lake Isabella. Upstream from the reservoir, the South Fork of the Kern River divides the Piute Mountains and Scodie Mountains from the Kern Plateau. The North Fork of the Kern River divides the Greenhorn Mountains from the Kern Plateau. S

Surface water resources for the Sequoia National Forest are predominately in the Kern and Tule Rivers. Flows from Sequoia National Forest streams have been highly variable over the span of several decades. Natural variation in flow is due to the long and short term climate cycles that influence precipitation. Timing of peak flows from snow melt is earlier than it was ten years ago, and reflects warmer than normal spring temperatures (Stewart 2009, Hunsaker et al. 2013). Six hydroelectric projects are located on the forest, four on the Kern River, and two on the Tule River. These hydroelectric projects are run off of the rivers, but do influence the flows and timing of flows of the rivers.

The Sierra Nevada Ecosystem Project (SNEP 1996) that the aquatic/riparian systems of the Sequoia National Forest were the most altered and impaired habitats of the Sierra Nevada. Three impaired

functioning watersheds from the Watershed Condition Classification in the Plan Area are: Isabella Lake (Kern River), Isabella Lake (South Fork Kern River) and Hume Lake.

According the recent assessment, 43 percent of watersheds were properly functioning, 52 percent were "functioning at risk", and five percent had" impaired" function. Habitat fragmentation, flow alteration, exotic species, road density, and road proximity to water were the most common stressors affecting watersheds that were not properly functioning.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Composition, structure, and fire regimes have changed considerably since pre-settlement times (Van de Water and Safford 2011), and are largely outside the natural range of variability in the Greenhorn Mountains and other areas of the plan area. Pines and oaks have decreased substantially and shade tolerant species, such as cedar and fir, have increased.

Compared to past conditions, forest density is greater, tree canopy is denser, and small and medium trees are more dominant in the forest. Within stand variation in tree size and density has decreased. Drought has triggered tree mortality in mixed conifers; and large tree mortality has doubled in the last 2-3 decades across the western United States. This pattern is associated with increases in temperature and droughts.

Large snags and trees can be found in the montane zone where mixed conifer and yellow pine forests (ponderosa and Jeffrey) dominate across most of the Sequoia National Forest (46 percent of the assessment area). In addition to these species, incense cedar, and white fir occur. Large tree density varies considerably by forest type. High elevation red fir, lodgepole pine and Jeffrey pine forests have relatively high mean or median densities. Trees greater than 30 inches in diameter are generally four trees per acre or more. The coefficient of variation (COV), a measure of how variable those numbers are is 122 percent. This means that the densities vary radically across the landscape. Although mean or median levels are moderate in these forest types, the coefficients of variation are often high. Mixed conifer forests have moderate but highly variable densities of trees greater than 30 inch diameter but trees greater than 40 inch diameter are sparse. These forests occur on more productive sites and trees greater than 40 inches in diameter were once more common. In ponderosa pine dominated forests, large trees (diameter greater than 30 inches) are less common and highly variable in occurrence, with mean and median densities of 2.8 and 2.0 trees per acre respectively. Hardwood-conifer and hardwood forests have relatively high densities of trees greater than 21 inch diameter (2 to 18 trees per acre) but the levels are highly variable. Densities of snags greater than 15 inches follow similar patterns by forest type but with levels at least 100 percent lower.

The projected status of those ecological conditions relative to the species considered

In general, large scale uncharacteristically severe wildfire are expected to increase in frequency and intensity, poses a risk to bald eagle habitat. Bark beetle outbreaks are expected to further exacerbate already dry conditions and increase fire risk, but will also provide opportunities for snag recruitment.

According to the recent fire resilience assessment, (Fites-Kaufman et. al. 2007), low and mid-elevation mixed conifer, pine, and foothill areas are mostly low to very low resilience under all weather conditions. Under hotter, drier and windier conditions all the mid and lower elevations have low to very low resilience to fire and would be prone to high severity fire and high levels of tree mortality. On the Kern Plateau, however, Jeffrey pine and eastside mixed conifer forests have variable fire resilience and tend to be drier and more open, with slower rates of fuel accumulation-overall fire resiliency is higher. This greater resiliency may reflect the lower fuel loading, lower moisture stress, and greater use of wildland

fire for resource benefit in forest ecosystems on the Kern Plateau. Current trends do not show a significant increase in the extent of forest change from wildfire on the Sequoia National Forest substantial areas are at a low and very low fire resiliency index as described in Chapter 3 of this assessment, indicating they are susceptible to higher amounts of crown fire than expected.

In summary, anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. In addition, projected increases (2006-2050) in mountain pine beetle activity for high-elevation white pine forest will have substantial cascading impacts on subalpine forest ecosystems, leading to outbreaks that can cause significant changes in forest structure, function, and composition (Meyer 2013).

Groundwater is dependent on snow melt to recharge and since snowmelt occurs earlier and the elevation of snow may increase, where and when groundwater recharge occurs may change. Stream and lake levels may be influenced by spring runoff of snowmelt; low summer/fall flows; drought; or drawdown of hydroelectric reservoirs in the fall. This may influence prey availability for bald eagle.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Past fire suppression policies have led to conditions that result in large areas of high severity fire, which may affect species that use old growth forest components.

The Sequoia National Forest essentially abandoned even-aged reforestation management 20 years ago, in favor of stand or habitat maintenance vegetation thinning intended to control density and growth of stands. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production, and increases growth rates on those remaining trees.

There are over 20,000 acres of plantations on the Sequoia National Forest in need of treatment that would allow the stands to develop old forest conditions. The treatments are needed to reduce fuel loading, reduce inter-tree competition, and improve the species mix within the stands. While these plantations contain some large tree size material, the majority of the trees are only suited for biomass. There are few projects that provide adequate volume to potential markets to make the projects commercially viable. This limits the forest's ability to keep up with the pace and scale necessary to realize restoration benefits.

The Sequoia National Forest has been experiencing extreme drought and insect related (e.g. bark beetles, fir engravers). Mortality has been consistent across all major conifer forests with the most dramatic effects on fir species and ponderosa and Jeffrey pine. Statewide trends in 2017 indicate mortality at higher elevations in the white and red fir, compared to previous years where extensive mortality occurred in lower elevation pine and mixed conifer forests. The following table summarizes mortality and estimated dead trees from 2014-2017 aerial detection surveys. See the northern goshawk rationale for maps and more details on tree mortality.

Table 3. Preliminary estimated acres and number of tree mortality related to bark beetle outbreaks

Year	Estimated Acres of Mortality	Estimated Number of Dead Trees

2014	91,400	322,973
2015	387,000	6,130,000
2016	391,000	10,147,000
2017*	185,000	3,480,000

*preliminary estimates

Fishing opportunities and recreation uses are expected to continue and impacts from those activities will continue to occur. The California Department of Fish and Wildlife is expected to continue the fish stocking program. Reservoirs will continue to exist under current management and jurisdiction to fulfill their water storage and hydroelectric needs.

The rivers, lakes and reservoirs offer motorized and non-motorized boating, fishing, swimming, whitewater rafting and boating, windsurfing, and kayaking. There are three marinas on Lake Isabella, which is the only place on the forest offering motorized boating and which is popular for windsurfing. Boating on Lake Isabella is managed by Kern County, while lake access is managed by the Forest Service. Hume Lake is restricted to non-motorized boating. Whitewater outfitter guides provide rafting opportunities on the Kern River and Kings River. Private boating on the Kern River is managed though a permit system. Fishing opportunities are regulated by the California Department of Fish and Wildlife and are mostly seasonal, although some sections of rivers and Lake Isabella are open for fishing year round.

Recreational use of private planes, ultra-lights, gliders, and hang gliders can be observed over the Sequoia National Forest. Lake Isabella is an authorized seaplane landing area. Population growth has led to increased competition for water among various uses which can negatively impact bald eagle nesting behavior.

It is unlikely that the Forest will see expansion of hydropower development on the rivers within the Forest, since that potential has already been fully developed. Any increased energy production will be related to improved technology or expansion of existing facilities. Competition for water on the Sequoia National Forest, however, will likely increase and climate change is expected to further reduce water supplies and development and population growth will put even more demand on the available water.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Bald eagles are currently known to use the Sequoia National Forest for wintering and migration. Recent widespread bark beetle related tree mortality pose a considerable risk to availability of the large live tree component, and habitat loss resulting from high intensity fires continues to be a potential threat as is disturbance from recreationists. Disturbance from high recreationist use and development along the shores of Lake Isabella is perhaps the biggest risk factor affecting bald eagles on the Sequoia National Forest, since there are few natural lakes. This threat will continue to be a potential risk factor for this species, as human population levels and recreation activity are expected to increase. There is substantial concern for this species' ability to persist on the planning unit. Based upon the evidence and supporting best available science, bald eagle does meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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California spotted owl - *Strix occidentalis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Habitat loss, degradation, or loss of connectivity from high severity fire and management activities such as timber harvest; expansion of barred owls, climate change, pesticides and carbonates, and reduced genetic diversity.

Rationale for California spotted owl

NatureServe Global Rank: G3

NatureServe T Rank: T3

State Rank: S3

Other Designations: FS-SS; CA-SSC; CA-SGCN; BLM-SS; USFWS-BCC

The California spotted owl has a global rank of T3 (Vulnerable), a California State rank of S3 (Vulnerable), is a Region 5 Forest Service Sensitive species and a Management Indicator Species (MIS) representing late seral closed canopy coniferous forest. The USFWS is currently reviewing this species after a positive 90-Day Finding to determine if the species warrants protection under the Endangered Species Act. This species is also recognized as a California Species of Special Concern and a Species of Greatest Conservation Need.

While there are no rigorous estimates of population size for the California spotted owl, an attempt was made to estimate the population size using data from California Department of Fish and Wildlife and consists of 1,865 owl sites, with 1,399 of them occurring on National Forest System lands (USFWS 2006). Caution should be used in the interpretation of these estimates because they represent all recorded

sites from the past 30-40 years and current occupancy of these sites is unknown. Population trends from four demographic study areas in the Sierra Nevada suggest that the populations may be declining on National Forest System lands on the Eldorado, Lassen, and Sierra National Forests, and may be stable or increasing in the Sequoia Kings Canyon study area (Conner et al. 2013, Conner et al. 2016, Tempel and Gutierrez 2013, Keane 2014, Tempel et al. 2014). It is important to note that the 95 percent confidence interval for lambda, rate of population change, overlaps with 1. A lambda of 1 indicates a stable population; less than 1 indicates the population is decreasing, and greater than 1 indicates an increasing population. The cause of the suspected declines are unknown at this time (Keane 2014).

California Spotted Owls primarily occupy coniferous and mixed pine-oak forests that have late stage characteristics with canopy cover and tree size being the most important predictors of California spotted owl presence (Jones et al. 2017, North et al. 2017, Wood et al. 2018). California spotted owls choose roosts and nest sites in microhabitats within areas of dense vegetation, dense canopy cover, and complex, multi-story forest structure (Tempel et al. 2016, USFWS 2017). Being cavity nesters, they require snags or decadent trees that have cavities or mistletoe platforms, such as black oaks, multi-forked firs, or broken top incense cedars. Snags and large downed woody debris are required as they provide habitat for important prey species including northern flying squirrels and mice.

California spotted owls are long-lived and exhibit sporadic reproduction in response to environmental conditions and therefore are slow to recover from population declines. They are territorial, defending non-overlapping nesting territories.

Threats to persistence of California spotted owls include habitat loss, degradation, or loss of connectivity from high severity wildfire (Jones et al. 2016, Rockweit et al. 2017, USFWS 2017, Wood et al. 2018) and management activities such as timber harvest; expansion of barred owls, climate change, rodenticides, and noise disturbance (Gutierrez et al. 2017). Timber harvest has been identified as one of the most significant threats to spotted owl persistence (Gutierrez et al. 2017). Effects of vegetation treatments on persistence of spotted owl across its range are complex and not well understood. Treatments that result in a reduction of canopy cover to ≥40%, surface and ladder fuels, and vertical and horizontal stand structure, with an increase in regularly spaced trees may have negative impacts on spotted owls (Stephens et al. 2014, Tempel et al. 2014, Tempel et al. 2014a). (Seamans and Gutierrez 2007) and (Tempel et al. 2014a) found the availability and amount of late seral forest, with canopy cover >70% and a dominance of medium and large trees >30 cm and >60.9cm, respectively, were positively correlated with territory occupancy, survival, and population growth. Habitat edge is considered beneficial to spotted owls, perhaps increasing prey populations and access to prey by foraging owls. Recent changes in silviculture prescriptions are based on historic vegetative patterns and conditions selected for by spotted owls (Knapp et al. 2012); they are designed to retain stand structure and heterogeneity. Effects of these prescriptions on spotted owl populations are unknown.

It is generally accepted that dense forest conditions, including those with large trees and high canopy cover, can be at higher risk to landscape level disturbance from high-severity wildfire. There are opposing views regarding the impact of high-severity wildfire to spotted owl habitat and owl persistence (Ganey et al. 2017). One view is that high-severity wildfire is a primary threat to spotted owls due to landscape level loss of large trees and high canopy cover, and that fuels reduction treatments that successfully reduce the risk of high-severity wildfire can aid in sustaining desired conditions for spotted owl (Jones et al. 2016). An opposing view argues that high-severity wildfire was relatively common in many forest types occupied by spotted owls and does not pose an immediate threat, and further maintain that fuels reduction treatments are misguided because they degrade owl habitat and do not reduce the extent of high-severity fire.

Spotted owls have been documented to use habitat that has burned at low to moderate burn severity and that includes some proportion of high-severity fire (Roberts et al. 2011, Lee et al. 2012, Lee et al. 2013, Lee and Bond 2015). The amount of suitable habitat (green forest), the amount of suitable habitat that burned at high severity (Jones et al. 2016), and salvage logging likely affect continued occupancy by spotted owls (Gutierrez et al. 2016). High severity fires that results in the loss of dense mature forest, large snags and downed logs effectively remove preferred nesting and roosting habitat and can take centuries to regrow. Jones et al. (2016) concluded megafires pose a threat to spotted owls because occupancy probability for spotted owls declined by 22 % the year after the King Fire and declined by almost nine-fold in sites that burned at >50 % high severity. In the closely related Northern spotted owl, (Clark 2007) found that while spotted owls did roost and forage within high severity burn areas, the use was very low suggesting that this cover type was poor habitat for spotted owls. (Clark et al. 2011) found that annual survival rates were lower in northern spotted owls inhabiting burned areas or displaced by the wildfire as compared to owls that inhabited areas outside the burn perimeter. While short term benefits may be realized by spotted owls, such as increased prey and edge habitat, uncertainties remain regarding long-term occupancy and demographic performance of spotted owls at burned sites (Keane 2014). Specifically, uncertainty exists regarding how the amounts and patch sizes of high-severity fire will affect California spotted owl occupancy, demographics, and habitat over long time frames (Keane 2014). The results of simulation modeling research summarized in (Keane 2014) suggests that some fuels treatments can reduce fire risk and with minimal effects on owl reproduction, and may have long-term benefits of reducing wildfire risk that outweigh short-term effects of treatments.

Considerable uncertainty remains regarding the response of spotted owls to high-severity wildfire, especially over longer time frames (Ganey et al 2017). The considerable trend toward increasing extent and severity of megafires throughout the range of this owl, suggests that the cumulative effects of these fires could be significant (Ganey et al 2017). Ganey et al (2017) suggest forest restoration or fuels reduction treatments, including wider use of managed fire to reduce risk of high-severity wildfire, can be strategically located to optimize reduction of fire risk and reduce habitat loss. , There may be local impact spotted owl habitat, but reducing risk may be more beneficial overall. It is important to evaluate both the impacts of such treatments to spotted owls and the effectiveness of such treatments in mitigating fire behavior.

Barred owls are an increasing risk factor for California spotted owls in the Sierra Nevada. Barred owls can hybridize and also out-compete spotted owls. Barred owls were first recorded within the range of the California spotted owl in 1989 on the Tahoe National Forest. Two sparred owls (hybrids of spotted and barred owls) were reported in the Eldorado National Forest during 2003 to 2004 (Seamans et al. 2004). Barred owls were first recorded in the southern Sierra Nevada in 2004 (Steger et al. 2006). Ongoing research has documented 73 records of barred or sparred owls in the Sierra Nevada to date, with the majority of records from the northern Sierra Nevada (Tahoe, Plumas, and Lassen National Forests). Of note, five new records of barred owls were documented in the Stanislaus and Sierra national forests in 2012, indicating further range expansion of barred owls in the southern Sierra Nevada. In 2017, confirmed barred owls were on the Sequoia National Forest. Barred owl numbers are likely higher than documented in the Sierra Nevada, as there have been no systematic surveys for them to date.

Climate change may have negative effects on spotted owls. Increasing temperatures may affect spotted owl survival, reproduction, recruitment, and population growth (Gutierrez et al. 2016). Climate change may also result in geographic shifts in habitat distribution, abundance, and quality, increase the amount of high severity wildfire, increase large tree mortality caused by insects and disease, and change prey distribution and abundance (Gutierrez et al. 2016). Poisoning by rodenticides is considered a significant emerging threat, but there is little information available on the effects of and appropriate mitigations of

this threat. Disturbance associated with human recreation and management activities is considered a threat to spotted owls and are considered localized in space and time. Protecting birds from noise disturbance during the breeding season, March 1 through August 15, can effectively mitigate acute noise and activity disturbance (Gutierrez et al. 2016).

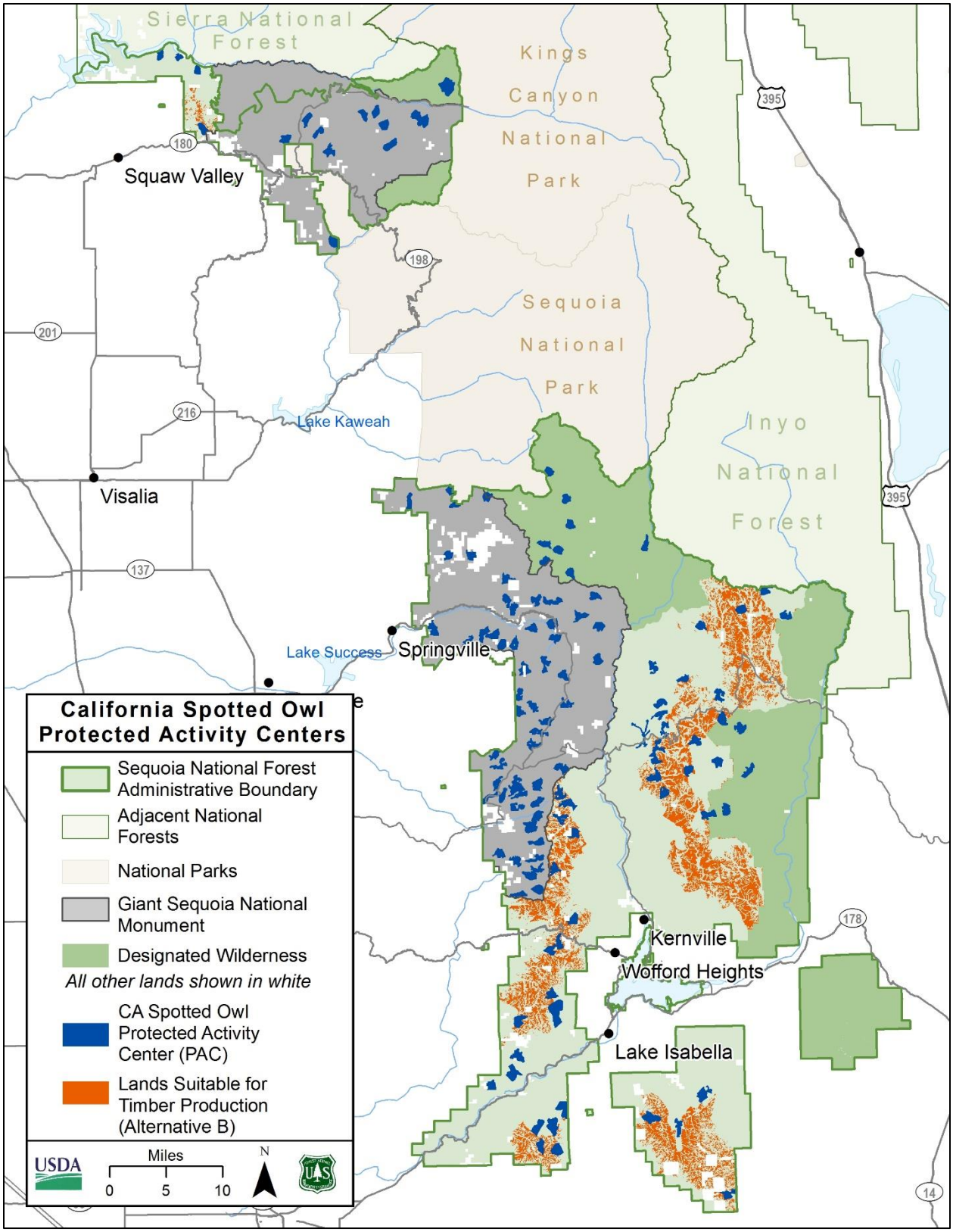

Figure 1. California spotted owl protected activity centers on the Sequoia National Forest and Giant Sequoia National Monument

Forest-Specific Rationale

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012 and is included here for reference only.

Information on current distribution of the species on the planning unit

Within the administrative area of the Sequoia National Forest, there are 136 currently designated spotted owl Protected Activity Centers (PACS) (Figure 1), with 66 occurring in the forest plan revision area and the remainder within Giant Sequoia National Monument. For the Sequoia National Forest plan area and Giant Sequoia National Monument, there are 2,352 records with 3,285 individuals of California spotted owl in the NRIS database that were recorded between 1900 and 2017. Many of these are likely repeat observations of the same individuals from year to year. Population trends on the Sequoia National Forest are unknown. A recent synthesis by Gutierrez et al. (2017) found spotted owl populations in the Sierra Nevada declining on most landscapes. An exception is the southernmost monitoring site, located within Sequoia and Kings Canyon National Parks. This site is in close proximity to the plan area and may best represent the population trend of spotted owls in the southern Sierras.

Key ecological conditions for this species (see above for additional information)

The mixed conifer habitat, and to a lesser extent montane hardwood forest types in this zone, provide the majority of habitat within California spotted owl protected activity centers on the Sequoia National Forest. Tree species typically include ponderosa pine, sugar pine, incense cedar, and white fir. Black oak is an important component of many mixed conifer stands, particularly at the lower elevations and on drier aspects (south and west). Dense canopy, snags and large down coarse woody debris are critical for spotted owl nesting and prey habitat.

Potential habitat (excluding private land) available to California spotted owl on the Sequoia National Forest is demonstrated by the California Wildlife Habitat Relationships (CWHR) habitat types (Table 4). Approximately 278,775 acres of forest are classified as having dense cover (60-100 % closure) while 269,532 acres have moderated cover (40-59 %) that could support species like spotted owl. There are approximately 124,744 acres of forest containing CWHR size classes > 24 inches (Sequoia assessment 2013-chapter 1 snapshot).

Table 4. Acres of potential habitat (excluding private land) available to California spotted owl on the Sequoia National Forest is demonstrated by the California Wildlife Habitat Relationships (CWHR)

CWHR Habitat Type	Acres
Montane Hardwood-Conifer	39,211
Red fir	105,801
Ponderosa Pine	27,556
Sierran Mixed Conifer	229,423
Jeffrey Pine	50,112
White Fir	2,853
Total	454,956

Many of the habitat attributes discussed for the California spotted owl are important to the fisher as well (USDA 2004: p. 7 of ROD). The Southern Sierra Fisher Conservation Area (SSFCA) encompasses the known occupied range of the fisher in the Sierra Nevada. This consists of an elevation band from 3,500 to

8,000 feet (errata March 2001e) on the Sierra and Sequoia National Forests. This area will be managed to support fisher habitat consistent with the protections for the owl.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

California spotted owl habitat on the Hume and Western Divide RDs of Sequoia National Forest is varied. The majority of nest and roost sites occur in mid slope regions between 4,000 and 7,500 feet in Sierran mixed conifer, montane hardwood conifer and giant sequoia vegetation types, with flying squirrels as the main prey source. At the lowest elevations in the oak woodland belt, owls can be found along canyon ravines within stringers of canyon live oak and most commonly consume woodrats. The southernmost Kern River Ranger District on the Sequoia National Forest is a transition zone between the southern Sierra Nevada, desert environments to the east that do not support spotted owls and spotted owl populations that occupy small pockets of suitable habitat on isolated mountains in southern California and the coast range. Spotted owls in this transition zone nest from low elevation pockets of live oak at 1,000 feet up to successful nests at over 9,000 feet in elevation. However the majority of known owl territories are in the black oak-conifer transition at 4,500 feet up to the mixed conifer- red fir transition near 8,500 feet. This district is comprised of a number of mountain ranges with unique characteristics, such as the Greenhorns, Breckenridge, and Piute Mountains, and the Kern Plateau. The Greenhorn Mountains are an extension of the west side Sierra Nevada mixed conifer habitats. The Greenhorns are primarily dense, second-growth fir and cedar that resulted from pre-1900 timber harvest and fire exclusion. These habitats appear to support a spotted owl population that is connected to the rest of the Sierra Nevada spotted owl population. Breckenridge Mountain and the Piute Mountains are isolated from the Greenhorn populations by gaps of several miles of unsuitable habitat. Both Breckenridge and the Piute Mountains are further isolated by loss of habitat due to large, stand replacing fires. These areas also have lower quality habitat that is closer to east-side Sierran pine due to poor site quality and lower mean annual precipitation. The owl territories on these mountains are few and widely separated due to habitat limitations.

Montane Zone

Composition, structure, and fire regimes have changed considerably since pre-settlement times (Van de Water and Safford 2011), and are largely outside the natural range of variability in the Greenhorn Mountains. Pines and oaks have decreased substantially and shade tolerant species, such as cedar and fir, have increased.

Compared to past conditions, forest density is greater, tree canopy is denser, and small and medium trees are more dominant in the forest. Within stand variation in tree size and density has decreased. Drought has triggered tree mortality in mixed conifers; and large tree mortality has doubled in the last 2-3 decades across the western United States. This pattern is associated with increases in temperature and droughts.

Large Trees and Snags

Large tree density varies considerably by forest type. High elevation red fir, lodgepole pine and Jeffrey pine forests have relatively high mean or median densities. Trees greater than 30 inches in diameter are generally four trees per acre or more. The coefficient of variation (COV), a measure of how variable those numbers are, is 122 percent. This means that the densities vary radically across the landscape. Although mean or median levels are moderate in these forest types, the coefficients of variation are often high. Mixed conifer forests have moderate but highly variable densities of trees greater than 30 inch diameter but trees greater than 40 inch diameter are sparse. These forests occur on more productive sites and trees greater than 40 inches in diameter were once more common. In ponderosa pine dominated forests, large trees (diameter greater than 30 inches) are less common and highly variable in occurrence, with mean and median densities of 2.8 and 2.0 trees per acre respectively. Hardwood-conifer and hardwood forests have

relatively high densities of trees greater than 21 inch diameter (2 to 18 trees per acre) but the levels are highly variable. Densities of snags greater than 15 inches follow similar patterns by forest type but with levels at least 100 percent lower.

Structural Heterogeneity

Variation in basal area was calculated on the Sequoia National Forest using Forest Inventory and Analysis (FIA) data. Almost all forest plots had had low within-stand variation. Large areas of high severity fire can reduce important forest structures such as large trees with cavities and mature mast-producing hardwoods. While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sequoia National Forest, substantial areas are at a low and very low fire resiliency index as described in Chapter 3 of the assessment, indicating they are susceptible to higher amounts of crown fire than expected.

The projected status of those ecological conditions relative to the species considered

Fire

According to a recent fire resilience assessment, (Fites-Kaufman et. al. 2007), low and mid-elevation mixed conifer, pine, and foothill areas are mostly low to very low resilience under all weather conditions. Under hotter, drier and windier conditions all the mid and lower elevations have low to very low resilience to fire and would be prone to high severity fire and high levels of tree mortality. On the Kern Plateau, however, Jeffrey pine and eastside mixed conifer forests have variable fire resilience and tend to be drier and more open, with slower rates of fuel accumulation-overall fire resiliency is higher. This greater resiliency may reflect the lower fuel loading, lower moisture stress, and greater use of wildland fire for resource benefit in forest ecosystems on the Kern Plateau.

According to the National Report on Sustainable Forests (Stanton and Christensen 2015), there is a high possibility of increased high intensity fire (resulting from climate change) that could decrease old forest and increase early seral habitat having cascading effects on patch diversity. Expected changes in climate and fire could lead to increased fragmentation of old forest and decreased fragmentation for early seral forest. With the exception of 2017, tree mortality has steadily increased the last several years, creating the potential for additional roosting habitat as a result of insect outbreaks and irruptions, but see related discussion above under fire for potential long term affects.

Insects and Pathogens

The Sequoia National Forest has been experiencing extreme drought and insect related (e.g. bark beetles, fir engravers) mortality and this is expected to continue. Mortality has been consistent across all major conifer with the most dramatic effects on ponderosa and Jeffrey pine and fir species. Statewide trends in 2017 showed that many areas experienced mortality at higher elevations (in the white and red fir), compared to previous years where extensive mortality was in lower elevation pine and mixed conifer forests. A summary of tree mortality from drought and bark beetle outbreaks is provided in the northern goshawk rationale.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

The spatial distribution of large trees and snags are unknown.

Key risk factors arising from non-ecosystem conditions and/or management activities

Connectivity and Climate Change

Overall, connectivity of old-forest associated species like spotted owl is high, but vulnerable to uniform, high intensity fire during more severe weather conditions. Weather conditions conducive to intense fire

are already increasing with climate change and are expected to increase more in the near and distant future. Schwartz et al. (2013) evaluated future climate exposure to vegetation using downscaled climate projections for the southern Sierra Nevada, including the Sierra and Sequoia National Forests. Their results indicate a high proportion of all terrestrial ecosystems will be moderately, highly, or extremely vulnerable to future climate by the end of the century. An assessment of species-specific exposure and sensitivity to climate change using two models ranked California spotted owls as "presumed stable" (Siegel et al. 2014).

Fire Suppression

Past suppression policies have led to conditions that can result in large areas of high severity fire that may be detrimental to old forest species such as the fisher or California spotted owl. There is some uncertainty about the effects of fire severity on these species (Keane 2013 and Zielinski 2013), however, current sciences suggests strategically placed landscape treatments (SPLATS) can reduce fire severity and spread, and that combining these fuel treatments with prescribed and managed fire can effectively reduce the extent of high-intensity fires in the Sierra Nevada under most conditions (Gutiérrez et al. 2017). Spotted owls appear to respond well to low-moderate severity fire.

Timber

The Sequoia National Forest essentially abandoned even-aged reforestation management 20 years ago, in favor of stand maintenance thinning harvests intended to control density and growth of stands, generally for habitat maintenance. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production, and increases growth rates on those remaining trees.

There are over 20,000 acres of plantations on the Sequoia National Forest in need of treatment that would allow the stands to develop old forest conditions. The treatments are needed to reduce fuel loading, reduce inter-tree competition, and improve the species mix within the stands. While these plantations contain some saw log size material, the majority of the trees are only suited for biomass. There are few projects that provide adequate volume to potential markets to make the projects commercially viable. This limits the forest's ability to keep up with the pace and scale necessary to realize restoration benefits.

Interspecific competition and hybridization

Barred owls are currently expanding their range into the Sierra Nevada and are considered an increasing threat to California spotted owls (Keane 2014). Barred owl is known to hybridize with the California spotted owl, jeopardizing its genetic integrity (Keane 2014). Six barred owls were detected in the southern Sierra Nevada during 2011–2012 (Keane 2014). It is considered a strong possibility that barred owls will ultimately colonize the entire Sierra Nevada and become a strong threat to California spotted owl (Gutiérrez et al. 2017).

Disease

There has been no evidence to indicate that West Nile Virus has affected California spotted owl populations. Hull et al. (2010) screened samples for WNV antibodies from 209 California spotted owls collected from the southern (Sierra National Forest, Sequoia and Kings Canyon National Parks) or northern (Plumas and Lassen National Forests) Sierra Nevada during 2004–2008 and results were negative for all 209 California spotted owls. However, Keane (in Gutiérrez et al. 2017), considered the virus an emerging thereat to viability.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The best available science indicates declining population trends in at least some portions of the California spotted owl range, with low fecundity, high juvenile mortality, and habitat specificity. These life history

characteristics combined with relevant threats and stressors, including habitat loss resulting from high severity fires, and mortality from drought and bark beetle outbreaks, indicate substantial concern about the California spotted owls capability to persist over the long-term in the plan area. Climate change and potential drought related effects will likely continue to exert pressure on the key ecological conditions (as noted above) that this species depends upon. The biggest immediate threat to California spotted owl is habitat loss resulting from stand replacing wildfire and the interrelated effects of widespread bark beetle mortality. There is substantial concern for this species' ability to persist on the planning unit. Based upon the evidence and supporting best available science, California spotted owl meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Great Gray Owl - *Strix nebulosa*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Small population size, meadow and adjacent forested habitat degradation or loss from fires and management practices including livestock grazing and timber harvest, vehicle strikes, climate change, recreation, and disease.

Rationale for great gray owl

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S1

Other Designations: CA-SE; FS-SS; CA-SGCN

The great gray owl has a global rank of G5 (Secure), a California State rank of S1 (Critically Imperiled), is recognized as a California Species of Greatest Conservation Concern, and is listed as Endangered under the California Endangered Species Act. The great gray owl is a Region 5 Forest Service Sensitive species. Although no yet officially recognized, a new subspecies has been proposed in the Sierra Nevada based on data that demonstrates genetic distance from other geographic populations; the proposed subspecies is known as *Strix nebulosa yosemitensis* (Hull et al. 2014*)*. Great gray owls outside the Sierra Nevada and in California are most likely *Strix nebulosa nebulosa*.

Wu and others (2016) recently estimated a population of about 160 breeding adults in California. While trends are unknown, declines in the Sierra Nevada are suspected based on threats including habitat loss or degradation, and the potential for inbreeding given such a small population size (Hull et al. 2010).

Great gray owls nest in conifer dominated habitats including montane hardwood conifer at lower elevations to Sierran mixed-conifer, white fir, red fir, and lodgepole pine at higher elevations (Wu et al. 2016). Breeding sites are frequently closely associated with meadows (Winter 1986, Greene 1995, Sears 2006, van Riper and Wagtendonk 2006, Keane 2011), but some have been located up to 750 m (2,460 ft) from the nearest meadow (Wu et al. 2015). They prefer dense canopy cover (> 80%) (Greene 1995, Wu et al. 2015) and high densities of large snags (Sears 2006, Wu et al. 2015). Great gray owls generally winter at lower elevations and use a variety of habitats including grassland, meadow, riparian areas, hardwood conifer and conifer forested habitats (van Riper and Wagtendonk 2006, Jepsen et al. 2011). They forage almost exclusively on pocket gophers and voles, but take other prey in lesser quantities such as deer mice, moles, shrews, beetles, squirrels, chipmunks, and alligator lizards (Winter 1986, Bull et al. 1989).

Threats to persistence of great gray owls include small population size, meadow and adjacent forested habitat degradation or loss from fires and management practices (e.g., livestock grazing and timber harvest), vehicle strikes, climate change, and disease. In Yosemite National Park human disturbance related to campgrounds and their development has been documented (Maurer 2006, Bull and Duncan 1993). The great gray owl population in California is at risk because it is very small (Hull et al. 2010). Small populations are more susceptible to inbreeding, population bottleneck, and founder effects. For example, in small populations, retention of maladaptive genes or the loss of adaptive genes could lead to reduced genetic diversity (Shaffer 1981, Lande 1993). Small populations are less able to recover from losses due to environmental stochastic events such as large wildfires (Wu et al. 2016).

Habitat degradation from inappropriate livestock grazing and timber harvest can be significant threats to great gray owl persistence (Wu et al. 2016). Livestock grazing can result in the removal of vegetative cover required by critical prey species (Beck and Winter 2000). Other secondary effects of grazing include lower water tables, lower meadow vegetative diversity, and increased soil compaction or erosion (Fleischner 1994, Belskey et al. 1999) which degrade habitat for prey species (Torre 2007, Rickart 2013).

Prey habitat relationships in regard to the height of herbaceous vegetation are largely unknown for the Sierra Nevada; there are several pocket gopher species and two vole species known to occur in the Sierra

Nevada (Moritz et al. 2008). Voles and pocket gophers generally have different preferences for the height of herbaceous vegetation and tend to utilize slightly different areas of meadows. Pocket gophers prefer drier portions of meadows while voles tend to prefer moister portions, resulting in a complex abundance and distribution between the species that is unique to each meadow. The relationship between herbaceous height, species abundance, and vulnerability to predation by great gray owls is not well understood for the various species. Deleterious effects to one prey species may be beneficial to another prey species. Voles may be negatively correlated with grazing intensity (Winter 1986, Johnson and Horn 2008, Rickart 2013, Kalinowski et al. 2014), whereas gopher density may increase or decrease with grazing (Dull 1999, Powers et al. 2011). Recommendations for some prey species include maintaining sward height of at least 20cm (8 in) (Kalinowski et al. 2014) or maintain herbaceous vegetation at a height of 300mm (12 in) (Beck 1985, Greene 1995). Proper range management would reduce impacts on prey species habitat. Limiting, restricting, or resting meadows from grazing activity if they are not functioning properly is also recommended (Beck 1985, Beck and Winter 2000).

Great gray owls can be threatened by timber harvest that results in an open canopy cover condition, removes nest structures, or disturbs breeding owls. Within suitable breeding habitat, timber harvest prescriptions that include retention of large live conifers, all large oaks, and retains snags at the rate of four per acre greater than 40 inches DBH (if possible, or greater than 24 in), and maintenance of at least 65% canopy cover, are considered compatible with great gray owl habitat requirements (Wu et al. 2016). Wu and others (2016) also recommend maintaining a limited operating period prohibiting road construction and vegetation treatments from February 15 through August 5 to protect breeding birds unless surveys indicate non-nesting status.

Additional threats to the persistence of great gray owls include vehicle strikes, which are considered a significant source of direct mortality because of the owl's use of low perches when hunting (Wu et al. 2016). Reduced speed limits or increasing the height of roadside fence lines and posts is recommended. While the effects of fire on great gray owls is not fully understood, loss and degradation of breeding habitat, as described above, are a considered a threat (Wu et al. 2016). Prescribed fire operations and suppression efforts should include protection of large trees (live and dead) as well as any known nest sites in occupied or suitable habitat areas (Wu et al. 2016). Great gray owls are considered vulnerable to climate change (Siegel et al. 2014b), since it may result in reduced snowpack and moisture in meadow habitat (Hayhoe et al. 2004, Godsey et al. 2014). Disease, poisoning, predation, and human disturbance are also considered threats to great gray owls; however, limited information exists on effects of and appropriate mitigations to these threats.

Forest-Specific Rationale

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012 and is included here for reference only.

Information on current distribution of the species on the planning unit

There is one 1986 CNDDB record for great gray owl reported on Sequoia National Forest plan area, located a little over a mile north of Fish Creek Campground on the Kern Plateau. There are no NRIS database occurrence records in the plan area, no sightings reported in eBird, and there have been no detections of great gray owl recorded as part of the Sierra Nevada Avian Monitoring Information Network surveys in the plan area.

There are two CNDDB records for the Giant Sequoia National Monument (Figure 2), and 18 NRIS database records with 27 individuals located in Giant Sequoia National Monument. Reproductive

individuals have been observed in recent years on the Hume Lake RD, in Giant Sequoia National Monument. There are three active great gray owl sites and all are located in atypical habitat, in lower elevation areas of open pine stands, generally lacking large trees but with a large black oak component.

Key ecological conditions for this species (See above for additional details).

Great gray owl are most commonly found near montane meadows (and early seral stage habitat that support abundant prey) surrounded by dense forest of medium to large mixed conifer and red fir tree species. It is strongly associated with relatively large meadows (10 acres or groupings of meadows within 500 meters of each other that add up to 10 or more acres).

Some great gray owls in the Sierra Nevada nest in lower elevation sites, often in areas away from meadows and coniferous forest. Wu et al. (2015) found that 21% of the nest sites they visited were below elevations of 3,000 feet and over 0.4 mile from the nearest meadow. Almost one third of the nests were in oaks, rather than the typical broken-top fir snag. Including such nests, the Great Gray Owl's overall elevation range for nesting in the Sierra Nevada is approximately 700-2400 m above sea level.

As of 2018, there are three active great gray owl sites in lower elevations areas on the Hume Lake RD, within the Giant Sequoia National Monument plan area. All three PACs are in pine stands that generally lack large trees but have a large black oak tree component.

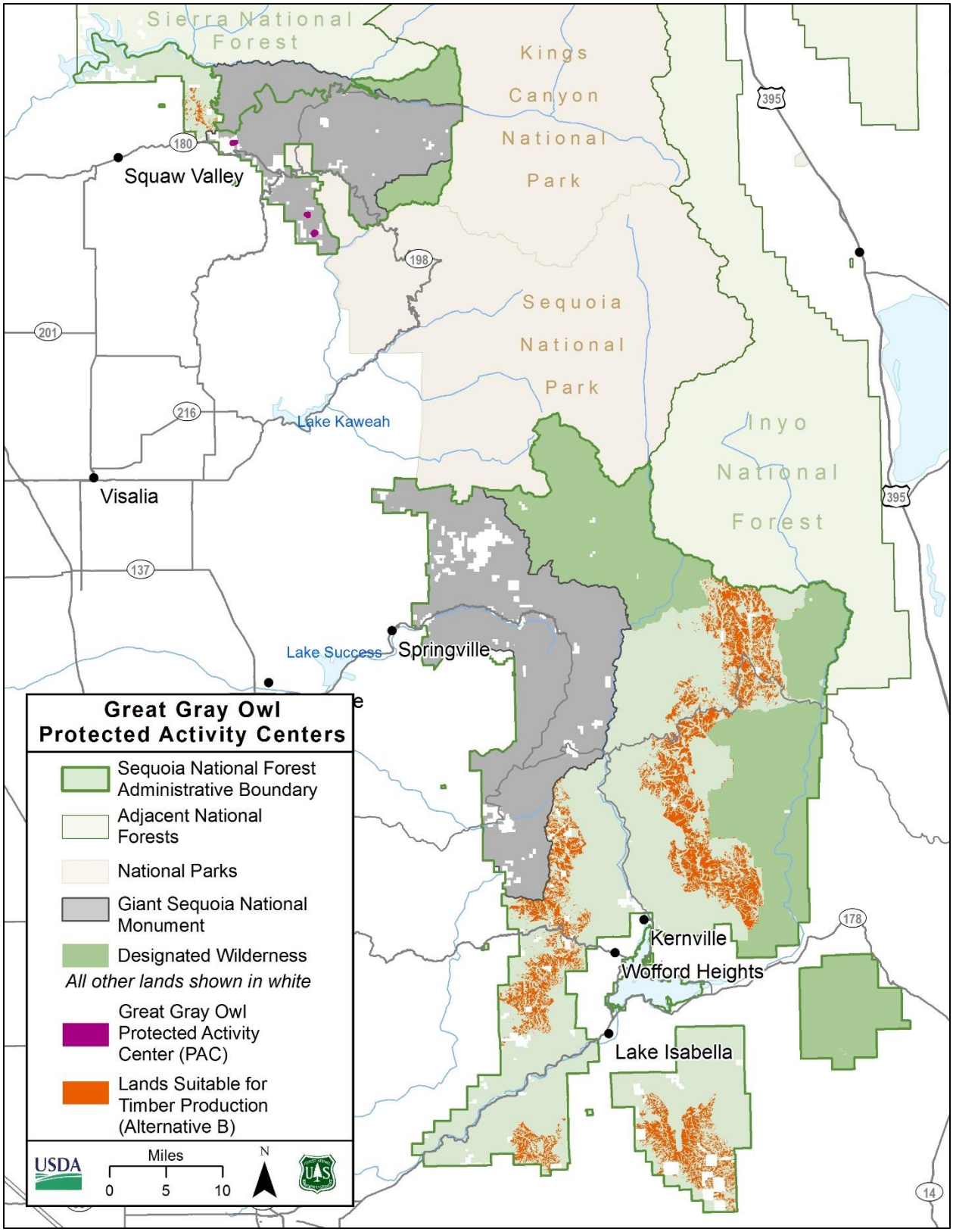

Figure 2. Great gray owl protected activity centers on the Giant Sequoia National Monument. None have been located on the Sequoia National Forest plan revision area.

Forested Conditions

On the Sequoia National Forest, great gray owl habitat can be found in the montane, upper montane zone, and subalpine zones which includes a mosaic of conifer forest, meadows, and montane chaparral. On the western slopes red fir, Jeffrey pine, and lodgepole pine are the dominant forest species (Fites – Kaufman et al. 2007). Upper montane forest occurs above mixed conifer and occupies ¼ of the assessment area, snow is the primary form of precipitation. Forest types in the Subalpine and Alpine Zone covers less than 5 percent of the area and includes red fir and lodge pole pine and subalpine meadows which may provide refugia for some species as climate change related stressors push species to the edge of their range. Alpine environments on the Kern Plateau may be among the most threatened.

Upper montane forests occur above mixed conifer, occupying one-quarter of the assessment area, where snow is the primary form of precipitation. Red fir forests with Jeffrey pine on the rockier sites occur in the northern half of the forest. In the southern half of the forest, red fir is replaced by white fir. On more productive sites, western white pine is also found.

Meadows

This species is strongly associated with relatively large meadows (10 acres or groupings of meadows within 500 meters of each other that add up to 10 or more acres). There are an estimated 556 meadows encompassing about 10,000 acres or ten percent of the total acres of the Sequoia National Forest. These meadows are unevenly distributed across the landscape.

Potential habitat (excluding private land) available to Great gray owl on the Sequoia National Forest, as defined by the CWHR is described in the table below. Approximately 278,775 acres of forest are classified as having dense cover (60-100 % closure) while 269,532 acres have moderated cover (40-59 %). There are approximately 124,744 acres of forest containing CWHR size classes > 24 inches (Sequoia assessment 2013-chapter 1 snapshot).

Table 5. Acres of potential habitat (excluding private land) available to great gray owl on the Sequoia National Forest is demonstrated by the California Wildlife Habitat Relationships (CWHR)

CWHR Habitat Type	Acres
Montane Hardwood-Conifer	39,211
Subalpine conifer	3,331
Montane Riparian	5,976
Ponderosa Pine	27,556
Lodgepole pine	15,471
Sierran Mixed Conifer	229,423
Jeffrey Pine	50,112
Red Fir	105,801
White Fir	2,853
Wet Meadow	4,424
Total	484,158

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Montane Zone

Composition, structure, and fire regimes have changed considerably since pre-settlement times (Van de Water and Safford 2011), and are largely outside the natural range of variability in the Greenhorn Mountains. Pines and oaks have decreased substantially and shade tolerant species, such as cedar and fir, have increased.

Compared to past conditions, forest density is greater, tree canopy is denser, and small and medium trees are more dominant in the forest. Within stand variation in tree size and density has decreased. Drought has triggered tree mortality in mixed conifers; and large tree mortality has doubled in the last 2-3 decades across the western United States. This pattern is associated with increases in temperature and droughts.

Large Trees and Snags

Large tree density varies considerably by forest type. High elevation red fir, lodgepole pine and Jeffrey pine forests have relatively high mean or median densities. Trees greater than 30 inches in diameter are generally four trees per acre or more. The coefficient of variation (COV), a measure of how variable those numbers are is 122 percent. This means that the densities vary radically across the landscape. Although mean or median levels are moderate in these forest types, the coefficients of variation are often high. Mixed conifer forests occur on more productive sites and have moderate but highly variable densities of trees greater than 30 inch diameter. Trees greater than 40 inch diameter are sparse, but were historically more common. In ponderosa pine dominated forests, large trees (diameter greater than 30 inches) are less common and highly variable in occurrence, with mean and median densities of 2.8 and 2.0 trees per acre respectively. Hardwood-conifer and hardwood forests have relatively high densities of trees greater than 21 inch diameter (2 to 18 trees per acre) but the levels are highly variable. Densities of snags greater than 15 inches follow similar patterns by forest type but with levels at least 100 percent lower.

Structural Heterogeneity

Variation in basal area was calculated on the Sequoia National Forest using Forest Inventory and Analysis (FIA) data. Almost all forest plots had had low within-stand variation. Large areas of high severity fire can reduce important forest structures such as large trees with cavities and mature mast-producing hardwoods. Fisher require areas with sufficient overstory and understory cover and uncharacteristically severe wildfire can reduce tree cover, fragment these areas and create barriers to animals traveling across heavily burned areas. These same key habitat elements can be affected by planned management activities.

While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sequoia National Forest substantial areas are at a low and very low fire resiliency index as described in Chapter 3 of the assessment, indicating they are susceptible to higher amounts of crown fire than expected.

Meadow habitat

The total area of meadows in the Sierra Nevada has decreased due to past and current land use practices such as dams, diversions, and recreation; upland vegetation encroachment from conifers and sagebrush as a result of fire suppression; or from drying due to stream channel incision (Gross and Coppoletta 2013).

Monitoring plots have been established for key area meadows under the Region 5 Range Long Term Monitoring Project. These plots are used to monitor rangeland condition and trend and the plots are re-read on a 5 year cycle. The plot locations are non-randomly selected and are located in areas within the meadow most likely to show change and transition. Generally, wetter meadows are in better condition than dry meadows most of the meadows sampled were in the mesic or wet meadow type.

Insects and Pathogens

The Sequoia National Forest has been experiencing extreme drought and insect related (e.g. bark beetles, fir engravers) mortality and this is expected to continue. Mortality has been consistent across all major conifer with the most dramatic effects on fir species and ponderosa and Jeffrey pine. Statewide trends in 2017 showed that many areas experienced mortality at higher elevations (in the white and red fir) where it had was not been mapped previously, compared to previous years where most of the extensive mortality was observed in lower elevation pine and mixed conifer forests. The impacts from bark beetle related tree mortality are summarized in the northern goshawk rationale.

The projected status of those ecological conditions relative to the species considered

Forested Conditions

According to the recent fire resilience assessment, (Fites-Kaufman et. al. 2007), low and mid-elevation mixed conifer, pine, and foothill areas are mostly low to very low resilience under all weather conditions. Under hotter, drier and windier conditions all the mid and lower elevations have low to very low resilience to fire and would be prone to high severity fire and high levels of tree mortality. On the Kern Plateau, however, Jeffrey pine and eastside mixed conifer forests have variable fire resilience and tend to be drier and more open, with slower rates of fuel accumulation-overall fire resiliency is higher. This greater resiliency may reflect the lower fuel loading, lower moisture stress, and greater use of wildland fire for resource benefit in forest ecosystems on the Kern Plateau.

According to the National Report on Sustainable Forests (USFS 2004), there is a high possibility of increased high intensity fire (resulting from climate change) that could decrease old forest and increase early seral habitat having cascading effects on patch diversity. Expected changes in climate and fire could lead to increased fragmentation of old forest and decreased fragmentation for early seral forest. With the exception of 2017, tree mortality has steadily increased the last several years, creating the potential for additional roosting habitat as a result of insect outbreaks and irruptions, but see related discussion above under fire for potential long term affects.

In summary, anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. In addition, projected increases (2006-2050) in mountain pine beetle activity for high-elevation white pine forest will have substantial cascading impacts on subalpine forest ecosystems, leading to outbreaks that can cause significant changes in forest structure, function, and composition (Meyer 2013).

Meadows

Future changes in climate (i.e. increasing temperatures) combined with a change from a snow-dominated to a rain-dominated system will impact meadows due to changes in the hydrologic regime. Total meadow area may decline and wet meadows may shift to dry meadows, especially small irregularly shaped meadows at low to mid elevations (Gross and Copoletta 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

Spatial configuration of large trees and snags.

Key risk factors arising from non-ecosystem conditions and/or management activities

Vegetation Management

Past suppression policies have led to conditions that can result in large areas of high severity fire that may be detrimental to old forest species. The Sequoia National Forest essentially abandoned even-aged

reforestation management 20 years ago, in favor of stand maintenance thinning harvests intended to control density and growth of stands, generally for habitat maintenance. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production, and increases growth rates on those remaining trees. Current plan guidance requires Protected Activity Centers (PACs) of at least 50 acres of the highest quality nesting habitat be established around all known great gray owl nest stands to mitigate risk from forest activities. These areas general have a limited operating period, prohibiting vegetation treatments and road construction within ¼ mile of an active great gray owl nest stand, during the nesting period (typically March 1 to August 15).

There are over 20,000 acres of plantations on the Sequoia National Forest in need of treatment that would allow the stands to develop old forest conditions. The treatments are needed to reduce fuel loading, reduce inter-tree competition, and improve the species mix within the stands. While these plantations contain some saw log size material, the majority of the trees are only suited for biomass. There are few projects that provide adequate volume to potential markets to make the projects commercially viable. This limits the forest's ability to keep up with the pace and scale necessary to realize restoration benefits.

Grazing

Inappropriate grazing practices, where plant cover is greatly reduced can reduce habitat for prey species like voles and gophers. Current livestock numbers on the Sequoia National Forest are approximately 60 percent of those permitted in the 1960s. Conditions in meadows and riparian areas have generally been improving and most measures of rangeland condition indicate an upward trend.

Livestock grazing is likely to be sustained within the planning area over the next 20 years. The amount of livestock grazing may decline to some degree due to reduced forage capacity (declining condition of upland browse, lack of fire, and timber canopy closure) and tighter administrative constraints for protection and enhancement of threatened, endangered, sensitive species habitat and other resource concerns such as water quality. Current plan guidance includes measures to maintain adequate herbaceous cover for great gray owl prey species.

Road related mortality

Public use of forest roads has grown steadily and driving for pleasure is the single largest recreation use of Forest Service managed lands. This poses a risk to great gray owl flying low over roadways in search of prey. The Sequoia National Forest currently manages and maintains approximately 1,646 miles of system roads. There are no confirmed road related mortality on the Sequoia National Forest, however increasing population and recreational use will continue to be a risk factor. The only documented road mortality occurred in the Giant Sequoia National Monument in the Stony Creek area.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

There are few observations of great gray owl on the Sequoia National Forest, which is at the southern extent of the species range. There are three active great gray owl sites located on Hume Lake Ranger District, in the Giant Sequoia National Monument plan area, but nesting is suspected but unconfirmed in the Sequoia National Forest plan area. Widespread loss of habitat from uncharacteristic stand replacing fire, and anticipated loss from climate change and reductions in groundwater run-off, are the biggest threats to this species on the Sequoia National Forest. These factors combined with range wide small population numbers (estimated at only 100-200 individuals in CA and as few as 14 breeding individuals) puts great gray owl at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, great gray owl meets

the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Kern red-winged blackbird - Agelaius phoeniceus aciculatus

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Stressors to watershed conditions and anything that negatively affects hydrologic flow; water withdrawals and impoundments, invasive species, fire, and climate change.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T1T2

State Rank: S1S2

Other Designations: CA-SSC; CA-SGCN

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

The Kern red-winged blackbird has been known to inhabit east central Kern County, in Walker Basin and on the South Fork of the Kern River on the Sequoia National Forest (Mailliard 1915a, 1915b). Within the Sequoia National Forest, breeding colonies have been recorded only in marshes around the east end of Lake Isabella adjacent the Kern River.

The breeding population in the South Fork Kern River Valley was previously estimated to number as many as 500 individuals, and a survey in the Walker Basin in 2001 found approximately 50 red-winged blackbirds believed to be this subspecies (Gallion 2008). It is unknown if the subspecies continues to persist in the Walker Basin.

Population trends for this species are currently unknown (Shuford and Gardali 2008). There are no records for Kern red-winged blackbird on the forest in the NRIS database, CNNDB, nor from the Sierra Nevada Avian Monitoring Information Network (California Avian Data Center) http://data.prbo.org/apps/snamin/index.php?page=bioreg-map-study-locations. However, there are numerous records for red-winged blackbird in eBird. It is assumed that red-winged blackbird observed in the Kern River Valley are the Kern subspecies (which is hard to differentiate in the field). DNA analysis is

needed to confirm the subspecies (P. Wohner, J. Stanek Southern Sierra Research Station, pers. comm, 2018).

Key ecological conditions for this species

The ecological requirements of the Kern red-winged blackbird are largely undescribed, however, earlier descriptions note the subspecies preference for “marshy meadows and lagoons which support growths of cattails and sedges” (Gallion 2008). Similar to tri-colored blackbird, this species needs emergent wetlands with freshwater cattail and tule marshes.

Important nesting areas are protected on the Audubon Kern River Preserve (managed by the National Audubon Society), Canebrake Ecological Reserve (managed by California Department of Fish and Wildlife), and the South Fork Wildlife Area (managed by the Sequoia National Forest). South Fork Wildlife Area is a 1271-acre unit of the Sequoia National Forest along the western edge of the South Fork of the Kern River between the western boundary of the privately owned Audubon Kern River Preserve and the eastern shore of the Isabella Reservoir. The area consists of Valley foothill riparian habitat dominated by cottonwood and willow trees.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Meadow Habitat

The total area of meadows in the Sierra Nevada has decreased due to past and current land use practices such as dams, diversions, and recreation; upland vegetation encroachment from conifers and sagebrush as a result of fire suppression; or from drying due to stream channel incision (Gross and Coppoletta 2013).

Monitoring plots have been established for key area meadows under a Region 5 long term monitoring project. These plots are used to monitor rangeland condition and trend and the plots are re-read on a 5 year cycle. The plot locations are non-randomly selected and are located in areas within the meadow most likely to show change and transition. Generally, wetter meadows are in better condition than dry meadows most of the meadows sampled were in the mesic or wet meadow type.

Lakes/Water

On the southern portion of the forest, below Lake Isabella reservoir, the Kern River separates the Breckenridge Mountains from the Greenhorn Mountains. The Kern River drains the southern and eastern portions of the Greenhorns and is impounded at Lake Isabella. Upstream from the reservoir, the South Fork of the Kern River divides the Piute Mountains and Scodie Mountains from the Kern Plateau. The North Fork of the Kern River divides the Greenhorn Mountains from the Kern Plateau.

Six hydroelectric projects are located on the forest, four on the Kern River, and two on the Tule River. These hydroelectric projects are run off of the rivers, but do influence the flows and timing of flows of the rivers.

Surface water resources for the Sequoia National Forest are predominately in the Kern and Tule Rivers. Flows from Sequoia National Forest streams have been highly variable over the span of several decades. Natural variation in flow is due to the long and short term climate cycles that influence precipitation. Timing of peak flows from snow melt is earlier than it was ten years ago, and reflects warmer than normal spring temperatures (Stewart 2009, Hunsaker et al. 2013).

The Sierra Nevada Ecosystem Project (SNEP 1996) describes the aquatic/riparian systems of the Sequoia National Forest as the most altered and impaired habitats of the Sierra Nevada. Three impaired

functioning watersheds from the Watershed Condition Classification in the Plan Area are: Isabella Lake (Kern River) and Isabella Lake (South Fork Kern River).

According to the recent assessment, 43 percent of watersheds were properly functioning, 52 percent were "functioning at risk", and five percent had" impaired" function. Habitat fragmentation, flow alteration, exotic species, road density, and road proximity to water were the most common stressors affecting watersheds that were not properly functioning

Water quality and quantity are at present well within the natural range of variability in most areas of the forest. However, climate change is a stressor which may limit water quality and quantity in the future. Watersheds are overall in good condition, and most are able to recover from most perturbations imposed by human influence or are within the natural range of variability. A few are impaired due to water withdrawals or impoundments. Invasive species, fire, and climate change remain stressors on watershed condition.

The projected status of those ecological conditions relative to the species considered

Groundwater is dependent on snow melt to recharge and since snowmelt occurs earlier and the elevation of snow may increase, where and when groundwater recharge occurs may change. Stream and lake levels may be influenced by spring runoff of snowmelt; low summer/fall flows; drought; or drawdown of hydroelectric reservoirs in the fall. This can cause a temporal mismatches and availability of nesting habitat availability wetland dependent species.

Future changes in climate (i.e. increasing temperatures) combined with a change from a snow-dominated to a rain-dominated system will impact meadows due to changes in the hydrologic regime. Total meadow area may decline and wet meadows may shift to dry meadows, especially small irregularly shaped meadows at low to mid elevations (Gross and Copoletta 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Tamarisk and other invasive plants moving into wetlands along the South Fork Kern River may threaten the foraging and nesting habitat of the Kern red-winged blackbird (Gallion 2008). Any loss of wetland habitat through climate change or human water uses would likely adversely affect this subspecies. Changes in water levels at Lake Isabella may also be a threat, but regulating those levels is outside the authority of the Forest Service.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Kern red-winged blackbird is endemic to California. It is restricted in range to the Kern River Valley and Walker Basin in Kern County. Potential habitat for this species is limited to Lake Isabella and adjacent Kern River vicinity. Kern red-winged blackbird and its associated habitat are at risk due to water use from expanding population pressures and human demands; increasing temperatures, temporal changes in precipitation, and runoff events all related to climate change; and habitat loss caused by invasive species. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, Kern red-winged blackbird meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area

Best Available Scientific Information Considered

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Mount Pinos Sooty grouse - *Dendragapus fuliginosus howardi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Threats include hunting, incompatible timber harvest, fire suppression and altered fire regime, livestock grazing, land development, recreational use of habitat and climate change.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T1T2

NatureServe State Rank: S2S3

Other Designations: CA Species of Special Concern, CA Species of Greatest Conservation Need

At the species level, sooty grouse (*Dendragapus fuliginosus*) is dispersed throughout coastal northern California and Sierra Nevada. Although subspecies of *D. fuliginosus* are not identified in eBird, NatureServe considers *Dendragapus fuliginosus howardi* to be a valid subspecies; the majority of sightings are thought to be the subspecies *D. f. sierrae*.

The Mt. Pinos sooty grouse, *Dendragapus fuliginosus howardi*, is considered one of three subspecies of sooty grouse in California. The historical range of *D. f. howardi* is believed to have included parts of the

Los Padres, Inyo and Sequoia National Forests; distributed in the southern Sierra Nevada south of Kings Canyon, Piute Mountains, Tehachapi Mountains, Mount Pinos/Mount Able (Cerro Noroestre) area, and Frazier Mountain in southern Califronia (Willet 1933, Grinnell and Miller 1944). The CNDDB database contains two records for the subspecies: four birds found on the Los Padres NF in 1931; and six birds on Sequoia National Forest in May 2004. Surveys over the past century indicate the range of Mt. Pinos Sooty Grouse receded roughly 100 miles and recent data suggest that the northward decline is continuing (Bland 2013). Sooty grouse have not been found in the southern portion of this range (i.e., isolated mountain habitats) since the early 1990s, with rare reports from south of the Tulare-Kern County line (Bland 2008). Bland (2008) suggests that sooty grouse observed south of Tulare County in recent decades may have been birds dispersing from a Sierra Nevada source, rather than members of a resident breeding population. Currently, the southernmost known breeding locations are at Sunday Peak in south-central Tulare County and Sherman Peak in southeastern Tulare County (Bland 2008). Records for the White Mountains, Mono County, were once provisionally presumed to be *D. f. howardi*, but have since been considered *D. f. sierrae*.

Recent unpublished studies by G. Barrowclough of the mtDNA control region (i.e., cited in Natureserve) of old specimens of grouse from Mt. Pinos, suggest that those grouse are distinct, may be restricted to a smaller area, and represent an extinct species; and the morphologically distinct *D. f. howardi* is not genetically distinct from *D. f. sierrae*. Despite the genetic outcome, Bland (2017) emphasizes the importance of the contraction of *D. f. howardi* from Kern County and the southern part of Tulare County. From Dr. Bland (2017):

> According to current taxonomy, the transition from sierrae to howardi occurs at 37 N latitude, approximately Kings Canyon. Extant populations south of Kings Canyon and north of Kern Gap (Tulare/Kern Co. line) are howardi. There are plumage differences that distinguish sierrae from howardi. Ongoing research suggests all remaining populations currently recognized as howardi possess the same mitochondrial haplotypes as sierrae populations further north, and that extinct populations south of Kern Gap were a unique species. The use of mtDNA to distinguish "phylogenic" species is not universally accepted however, so until a mtDNA-based publication passes the peer-review process, I suggest the currently recognized taxonomy be used for planning purposes. The visible (phenotypic) differences are there, regardless of mtDNA results (although the differences are gradual, rather than abrupt, at the distribution boundary). Regardless of subspecies taxonomy, the range of sooty grouse in the southern Sierra Nevada Region has retracted northward roughly 100 miles over the past century.

Sooty grouse are associated with upper elevation fir forests that may be affected by vegetation management and climate change. In early spring, sooty grouse congregate in open mature stands of conifers near the crests of ridges. These “hooting sites,” or “spring activity centers” are traditional, and are returned to year after year, generation after generation. Loss of large trees from these areas are detrimental to grouse. In late spring and summer through fall, females and their young are associated with meadows and other mesic areas. In winter, sooty grouse seek dense conifer stands at high elevations where they subsist almost entirely on fir needles. Sooty grouse is hunted in Fresno and Tulare Counties.

California Department of Fish and Wildlife allow hunting on sooty grouse within both Inyo and Mono counties with a daily take of 2 birds, and a maximum possession of 6 birds (California DFW 2017 Regulations).

Forest-Specific Rationale

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012 and is included here for reference only.

Information on current distribution of the species on the planning unit

Currently, the southernmost known breeding locations are at Sunday Peak in south-central Tulare County and Sherman Peak in southeastern Tulare County (Bland 2008). There is a 2004 CNDDB record of six *D. f. howardi* on Sequoia National Forest plan area, on the northwest side of Cherry Hill. There are 5 observations labeled as *D. f. sierrae* in the NRIS database, all labeled as being on the Sequoia National Forest, with 1 observation from June 2012, 2 observations from August 2013, and 2 in July of 2016. However, these all fall within the boundary of Giant Sequoia National Monument. None of the 71 NRIS observations labeled as *Dendragapus fuliginosus*, sooty grouse,are reported in Sequoia National Forest plan area. Twelve of 398 observations in California that are mislabeled as *Dendragapus obscurus* (dusky grouse) occur on the Sequoia National Forest plan area.

In eBird there are numerous sightings of sooty grouse across the forest, particularly in Tulare County in the vicinities of Boone Meadow, Bald Mountain, Quaking Aspen Meadows and the Greenhorn Mountains in Kern County.

Key ecological conditions for this species (see above for additional information)

On the Sequoia National Forest, key ecological conditions for this species can be found in the Montane, Upper Montane Zone, and Subalpine Zones which includes a mosaic of conifer forest, meadows, and montane chaparral. On the western slopes red fir, Jeffrey pine, and lodgepole pine are the dominant forest species (Fites – Kaufman et al. 2007). Upper montane forest occurs above mixed conifer and occupies ¼ of the assessment area, snow is the primary form of precipitation. Forest types in the Subalpine and Alpine Zone covers less than 5 percent of the area and includes red fir and lodge pole pine and subalpine meadows which may provide refugia for some species as climate change related stressors push species to the edge of their range. Alpine environments on the Kern Plateau may be among the most threatened.

Upper montane forests occur above mixed conifer, occupying one-quarter of the assessment area, where snow is the primary form of precipitation. Red fir forests with Jeffrey pine on the rockier sites occur in the northern half of the forest. In the southern half of the forest, red fir is replaced by white fir. On more productive sites, western white pine is also found.

Potential habitat (excluding private land) available to Mount Pinos Sooty grouse on the Sequoia National Forest, is defined by the California Wildlife Habitat Relationships (CWHR) is displayed in Table 6. Approximately 278,775 acres of forest are classified as having dense cover (60-100 % closure) while 269,532 acres have moderated cover (40-59 %) and 122,031 acres (25-39%) have open cover. There are approximately 124,744 acres of forest containing CWHR size classes > 24 inches and 427,450 acres containing small trees 11-24 inches in diameter. (Sequoia assessment 2013-chapter 1 snapshot).

Table 6. Acres of potential habitat (excluding private land) available to Mt. Pinos sooty grouse on the Sequoia National Forest is demonstrated by the California Wildlife Habitat Relationships (CWHR)

CWHR Habitat Type	Acres
Montane Hardwood-Conifer	39211
Subalpine conifer	3331
Ponderosa Pine	27556
Lodgepole pine	15,471
Sierran Mixed Conifer	229423
Jeffrey Pine	50112
Red Fir	105,801

CWHR Habitat Type	Acres
White Fir	2853
Wet Meadow	4424
Total	47,8182

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Montane Zone

Composition, structure, and fire regimes have changed considerably since pre-settlement times (Van de Water and Safford 2011), and are largely outside the natural range of variability in the Greenhorn Mountains. Pines and oaks have decreased substantially and shade tolerant species, such as cedar and fir, have increased.

Compared to past conditions, forest density is greater, tree canopy is denser, and small and medium trees are more dominant in the forest. Within stand variation in tree size and density has decreased. Drought has triggered tree mortality in mixed conifers; and large tree mortality has doubled in the last 2-3 decades across the western United States. This pattern is associated with increases in temperature and droughts.

Large Trees and Snags

Large tree density varies considerably by forest type. High elevation red fir, lodgepole pine and Jeffrey pine forests have relatively high mean or median densities. Trees greater than 30 inches in diameter are generally four trees per acre or more. The coefficient of variation (COV), a measure of how variable those numbers are is 122 percent. This means that the densities vary radically across the landscape. Although mean or median levels are moderate in these forest types, the coefficients of variation are often high. Mixed conifer forests have moderate but highly variable densities of trees greater than 30 inch diameter but trees greater than 40 inch diameter are sparse, These forests occur on more productive sites and trees greater than 40 inches in diameter were once more common. In ponderosa pine dominated forests, large trees (diameter greater than 30 inches) are less common and highly variable in occurrence, with mean and median densities of 2.8 and 2.0 trees per acre respectively. Hardwood-conifer and hardwood forests have relatively high densities of trees greater than 21 inch diameter (2 to 18 trees per acre) but the levels are highly variable. Densities of snags greater than 15 inches follow similar patterns by forest type but with levels at least 100 percent lower.

Meadow habitat

The total area of meadows in the Sierra Nevada has decreased due to past and current land use practices such as dams, diversions, and recreation; upland vegetation encroachment from conifers and sagebrush as a result of fire suppression; or from drying due to stream channel incision (Gross and Coppoletta 2013).

There are an estimated 556 meadows encompassing about 10,000 acres or ten percent of the total acres of the Sequoia National Forest. These meadows are unevenly distributed across the landscape, scattered throughout the forest, except in the Kings Canyon inner gorge and between the Tule Reservation, north to the boundary of Sequoia National Park.

Monitoring plots have been established for key area meadows under the Region 5 Range Long Term Monitoring Project. These plots are used to monitor rangeland condition and trend and the plots are re-read on a 5 year cycle. The plot locations are non-randomly selected and are located in areas within the

meadow most likely to show change and transition. Generally, wetter meadows are in better condition than dry meadows most of the meadows sampled were in the mesic or wet meadow type.

The projected status of those ecological conditions relative to the species considered

Forested Conditions

According to the recent fire resilience assessment, (Fites-Kaufman et. al. 2007), low and mid-elevation mixed conifer, pine, and foothill areas are mostly low to very low resilience under all weather conditions. Under hotter, drier and windier conditions all the mid and lower elevations have low to very low resilience to fire and would be prone to high severity fire and high levels of tree mortality. On the Kern Plateau, however, Jeffrey pine and eastside mixed conifer forests have variable fire resilience and tend to be drier and more open, with slower rates of fuel accumulation-overall fire resiliency is higher. This greater resiliency may reflect the lower fuel loading, lower moisture stress, and greater use of wildland fire for resource benefit in forest ecosystems on the Kern Plateau.

According to the National Report on Sustainable Forests (USFS 2004), there is a high possibility of increased high intensity fire (resulting from climate change) that could decrease old forest and increase early seral habitat having cascading effects on patch diversity. Expected changes in climate and fire could lead to increased fragmentation of old forest and decreased fragmentation for early seral forest. With the exception of 2017, tree mortality has steadily increased the last several years, creating the potential for additional roosting habitat as a result of insect outbreaks and irruptions, but see related discussion above under fire for potential long term affects.

In summary, anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. In addition, projected increases (2006-2050) in mountain pine beetle activity for high-elevation white pine forest will have substantial cascading impacts on subalpine forest ecosystems, leading to outbreaks that can cause significant changes in forest structure, function, and composition (Meyer 2013).

Meadows

Future changes in climate (i.e. increasing temperatures) combined with a change from a snow-dominated to a rain-dominated system will impact meadows due to changes in the hydrologic regime. Total meadow area may decline and wet meadows may shift to dry meadows, especially small irregularly shaped meadows at low to mid elevations (Gross and Copoletta 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Vegetation Management

Past suppression policies have led to conditions that can result in large areas of high severity fire that may be detrimental to wildlife species that use old growth habitat components. The Sequoia National Forest essentially abandoned even-aged reforestation management 20 years ago, in favor of stand maintenance thinning harvests intended to control density and growth of stands, generally for habitat maintenance. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production, and increases growth rates on those remaining trees.

There are over 20,000 acres of plantations on the Sequoia National Forest in need of treatment that would allow the stands to develop old forest conditions. The treatments are needed to reduce fuel loading, reduce inter-tree competition, and improve the species mix within the stands. While these plantations contain some saw log size material, the majority of the trees are only suited for biomass. There are few projects that provide adequate volume to potential markets to make the projects commercially viable. This limits the forest's ability to keep up with the pace and scale necessary to realize restoration benefits.

Grazing

Current livestock numbers on the Sequoia National Forest are approximately 60 percent of those permitted in the 1960s. Conditions in meadows and riparian areas have generally been improving and most measures of rangeland condition indicate an upward trend.

Livestock grazing is likely to be sustained within the planning area over the next 20 years. The amount of livestock grazing may decline to some degree due to reduced forage capacity (declining condition of upland browse, lack of fire, and timber canopy closure) and tighter administrative constraints for protection and enhancement of threatened, endangered, sensitive species habitat and other resource concerns such as water quality.

Hunting

Sooty grouse hunting is authorized by California Department of Fish and Wildlife. Since sooty grouse species continues to be allowed for hunting it is reasonable to assume populations are at least stable. However, accurately differentiating between sooty grouse and the Mount Pinos subspecies in the field could be a potential risk factor. Currently, there are no detailed population estimates for hunted species in Sequoia National Forest other than for mule deer, although annual hunting permit data is collected by CDFG for hunted species. On the Sequoia National Forest, hunting is allowed in Fresno and Tulare County, where grouse populations are believed to be stable. Hunting is not allowed in Kern County, where grouse populations are small and isolated.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

According to current taxonomy, the transition from *Dendragapus fuliginosus sierrae* to *Dendragapus fuliginosus howardi* occurs at 37 N latitude, approximately Kings Canyon. Extant populations south of Kings Canyon and north of Kern Gap (Tulare/Kern Co. line) are howardi. Although a study suggests populations of the phenotypically distinct howardi possess the same mitochondrial haplotypes as sierrae populations further north, the use of mtDNA to distinguish "phylogenic" species is not universally accepted. The range of sooty grouse in the southern Sierra Nevada Region has retracted northward roughly 100 miles over the past century, and may be a relict population of a once more widespread species that occurred in the southern Sierra Nevada. Due to this limited distribution and moderate population decline throughout its range, the Sequoia National Forest may provide important refugia habitat. Some of this habitat, particularly in the subalpine forest may be especially at risk from climate change, further increasing viability risk. On the Sequoia National Forest, there is particular concern for this species in Kern County where populations are small and fragmented. *There is substantial concern about this species ability to persist on the planning unit.* Based upon the evidence and supporting best available science, Mount Pinos sooty grouse meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Bland, J.D. 2008. Mount Pinos Sooty Grouse, in California Bird Species of Special Concern: in (W. D. Shuford and T. Gardali, eds.) A Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California, Studies of Western Birds 1. W. Field Ornithology, Camarillo, CA. pp. 102–106.

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Northern goshawk - *Accipiter gentilis atricapillus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Loss of habitat due to high severity wildfire, human disturbance, and climate change.

Rationale for northern goshawk

NatureServe Global Rank: G5

NatureServe T Rank: T2T3Q

State Rank: S3

Other Designations: CA-SSC; CA-SGCN; BLM-SS; FS-SS

The northern goshawk has a global ranking of G5, indicating that the species is "secure: common, widespread and abundant" at the global scale, and has a rating of S3 in California indicating that it is "vulnerable" in California, and a rating of S2 in Nevada, indicating that it is "imperiled" in Nevada (NatureServe 2015). The northern goshawk is a California bird species of special concern and a California bird species of greatest conservation need. It is also listed as a California BLM sensitive species and Region 5 Forest Service sensitive species.

The goshawk is a Holarctic species (found throughout all the northern continents of the world), and the North American subspecies (*Accipter gentilis atricapillus*) breeds throughout Alaska, Canada, and mountains of the western United States and Mexico, and winters sporadically to the central-eastern United States and northern Mexico (Squires and Reynolds 1997b, AOU 1998). The range is relatively contiguous throughout North America. Six other subspecies occur in Eurasia (Squires and Reynolds 1997b). In California the Northern Goshawk breeds locally in coniferous and mixed-coniferous forest regions in northwestern California (Del Norte and Humboldt counties) and across both sides of the Sierra Nevada range, generally at elevations of 1400-3000 m (4,600-10,000 ft), south to Tulare and Mono counties (Bloom et al. 1985).

Northern Goshawks are considered locally uncommon as a breeding and wintering species in California (Bloom et al. 1985, Gaines 1992, Small 1994, Woodbridge and Detrich 1994, Bezener and Fix 2000, Keane 2008). Breeding densities in the Cascades of northern California are tied to sparsely distributed forest patches (Woodbridge and Detrich 1994). Population size of northern goshawk based on Breeding Bird Survey data from 1998-2007 is estimated at 7,000 individuals in California and 1,300 in the Sierra Nevada (PIF 2013, eBird 2016). Based on records from eBird and CNDDB, Northern Goshawks are only absent from two National Forests (NF) in California, the Angeles NF and Cleveland NF (CNDDB 2016, eBird 2016).

Breeding Bird Survey data throughout North America indicate essentially stable populations during 1966-2013 (-0.15% per year with non-significant and high variance around the mean) and 2003-2013 (+0.69% per year) (Sauer et al. 2014). In California the species also had a stable trend during 1966-2013 (+0.80% per year) and from 2003-2013 (-1.08% per year) (Sauer et al. 2014). According to Christmas Bird Count (CBC) data for all of North America from 1966-2013, trends were negative (-0.5% per year, 95% CI: -3.7-0.4) (Soykan et al. 2016). However, the Breeding Bird Survey and Christmas Bird Count are largely recognized as inadequate for monitoring population trends of goshawks (Keane 2008).

Northern goshawk is an irruptive migratory species, with breeding and winter distributions throughout North America. Many individuals may be resident in years when food resources are sufficient (Doyle and Smith 1994). Natal dispersal distances may also be driven in part by food availability (Kennedy and Ward 2003). Migration routes and winter range are not well known for this somewhat secretive species, but some banded individuals have been recovered up to 2,500 km (1,550 mi) from banding locations (Squires and Reynolds 1997a). The species is known to undergo both southward and down-slope migration in California (Bloom et al. 1985, Gaines 1992, Small 1994, Keane 2008). In the Sierra Nevada goshawks are generally year-round residents that expand home range size during the winter (Keane 1999). There is no evidence to suggest barriers to dispersal.

Northern goshawks tend to nest in forested habitat across their range, across all elevations, leading some to characterize them as habitat generalists at the landscape scale (Squires and Reynolds 1997a). Within their breeding home ranges they tend to select mature to old-growth forest stands, or forested areas that have large diameter trees and dense canopy (Greenwald et al. 2005). The finest scale of habitat selection and the best described is nest area, typically encompassing the area including the main nest tree and alternate nests (Squires and Kennedy 2006). Northern goshawks nest in areas with larger diameter trees, higher canopy closure, with an open understory (Squires and Ruggiero 1996, Squires and Reynolds 1997a). During winter and migration goshawks occur sporadically in other habitats including hardwood forests but variability of habitat selection, along with the apparent lack of winter site fidelity, results in less conservation concern than would be the case for habitat specialists (Garrett and Dunn 1981).

In California, northern goshawks typically nest in mature and old-growth forest stands. Suitable stands occur in a broad range of conifer and conifer-hardwood types, including ponderosa, Jeffrey, and lodgepole pine, mixed conifer, white and red fir, Douglas-fir, mixed redwood–Douglas-fir–hardwood, less common in quaking aspen and in pinyon-juniper (Gaines 1992). Nest stands are often on moderate slopes or benches, and have open understories. Response to wildfire is believed to differ substantially by region and historical fire regime. While high intensity wildfire appears to have a negative influence, lower intensity burning could be beneficial to goshawks by reducing colonization of understory by shade tolerant trees, and maintaining the open understory conditions that northern goshawks prefer (Squires and Kennedy 2006).

Upper montane forests utilized by northern goshawks have likely been less altered by forestry practices, fire management, and exurban development than lower-elevation forests, at least in most parts of the California range (Katibah 1984, Siegel and DeSante 1999, CalPIF 2000, Robinson and Alexander 2002, RHJV 2004, Bunn et al. 2007b). Fire suppression during the first part of the 20th century (Kilgore 1973) probably has had both positive and negative effects on northern goshawks, but historical timber-harvesting practices, especially clear-cutting, likely has had negative impacts on this species, and fuel-reduction by both mechanical means and by burning may be beneficial in the long run (Kotliar et al. 2002, Keane 2008).

In the southern Sierra Nevada, the suitable nesting habitat within closed canopy forests has recently been substantially impacted from large high-severity fires and landscape scale tree mortality related to drought and bark beetle outbreaks. Habitat occupancy rates for northern goshawk are known to decrease in areas of tree cover loss. For example, in the Rim Fire on the Stanislaus National Forest, the amount of high severity fire within a territory negatively affected occupancy and nesting of goshawk and prevalence declined overtime from 70% the year following fire to 54% three years post-fire (Kalinowski et al. 2017). These results indicate that high-severity fire and associated loss of tree cover reduces the quantity and quality of goshawk habitat and is a conservation concern in the increasingly fire-prone and bark beetle outbreak-prone forests of California (Kalinowski et al. 2017). Severe decreases in canopy cover resulting

from extensive bark beetle tree mortality may have similar effects as severe tree mortality caused by fire on goshawk productivity.

Clear-cutting impacts on the coarse scale altering habitat conditions for goshawks is of particular concern in areas of mixed "checkerboard" land ownership (Keane 2008). It appears goshawks require a minimum threshold amount (e.g. 80 ha in the southern Cascades) of nesting habitat in mature forest condition to maintain occupancy (Woodbridge and Detrich 1994). Thus, alteration of goshawk habitat on private lands adjacent to National Forest may increase the importance of habitat condition on National Forest for continued goshawk occupancy. For example, in mixed ownership areas on the Stanislaus National Forest, occupancy monitoring suggests that at least two northern goshawk territories were abandoned immediately following harvest activities, despite the maintenance of nearby suitable nesting habitat on National Forest land. Additional studies are needed to better determine what goshawks do and where they go after timber harvest (Rodriquez et al. 2016).

Multiple scientists have studied the effects of vegetation management (e.g. timber harvest, fuels treatments, etc.) and wildfire on the amount, distribution and quality of habitat (Bloom et al. 1985, Keane and Morrison 1994, Kennedy 1997, Squires and Reynolds 1997a, Daw et al. 1998, Smallwood 1998). The common threats identified include past timber harvest that resulted in a loss of large diameter trees and or foraging opportunities, principally in the lower elevations. Key ecological requirements for northern goshawks are suitable nesting and foraging habitat that support adequate prey populations. Rather than fluctuating randomly, limiting factors for raptor populations, including the northern goshawk are nest sites, habitat, and prey availability. Increasingly, a major threat to goshawks is fire which has impacted mature forests at all elevations in recent decades and is exacerbated by climate change. Lack of fire, which leads to overstocking of forest stands, along with drought and high ozone levels that stress trees can facilitate high fire severity (Long et al. 2014). During timber harvests in northern Idaho, nesting areas that retained >39% of the 170-ha (420 acres) of forest surrounding a nest were more likely to have goshawks reoccupy the area the following year (Moser and Garton 2009).

Rodriguez et al. (2016) conducted a meta-analysis and their results suggest that although both timber harvest and a lack of large trees are associated with lower occupancy by nesting goshawks, pairs that nest near timber harvest or in small trees have indistinguishable nesting success from pairs nesting in large trees or farther from timber harvest. However, if goshawk pairs do nest at timber-harvest sites, their reproduction appears unaffected by this harvest. In agreement with other reviews (Squires and Kennedy 2006), that regardless of forest type, goshawks prefer patches of more mature trees, relative to availability, for situating nests. Rodriguez et al. (2016) found only a lack of evidence that stand characteristics and timber harvest influence the success of nesting attempts that occur in the presence of timber harvest. When evaluating the size of buffers to timber harvest in regards to nesting success, Rodriguez et al. (2016) states that it remains mostly untested whether larger buffers might ameliorate negative effects of timber harvest on goshawk occupancy. Overall, the studies that compared goshawk nesting success to tree size or timber harvest were based on small samples which led to large confidence intervals around the average effect size reflecting low precision of the estimate (Rodriguez et al. 2016).

It is unclear how goshawk populations will respond to climate change. One potential threat from climate change is an increasing rate of fire in higher elevation forest stands (Schwartz et al. 2015), areas that contain old-growth forest that have largely been spared from harvest. However, the effects of fire in these stands is largely dependent on fire severity, as lower fire severity can maintain or benefit goshawk habitat. Based on the Climate Change Vulnerability index, a risk assessment tool developed by NatureServe to predict a species vulnerability to climate change, northern goshawk in the Sierra Nevada was rated as Moderately Vulnerable, which is defined as "abundance and/or range extent within geographical area

assessed likely to decrease by 2050" (Siegel et al. 2014c). Across their range, northern goshawks display population-specific demographic relationships with local weather and regional climates. Based solely on projections of climate change, this population-specific variation is anticipated to result in population-specific responses to future climate scenarios, which could range from little effect to potentially significant effects (Araújo et al. 2005, Long et al. 2014). For example, in Europe goshawks have responded positively to increasing temperatures that have enabled earlier breeding and larger clutches (Lehikoinen et al. 2013). The impact that climate change may have on goshawk nesting and foraging habitat and prey populations in the future is unclear. It is also unclear what if any effect climate change would have on goshawk populations, as these changes would likely very depending on population-specific conditions.

A study conducted by Morrison et al. (2011) in the Lake Tahoe Basin indicated that northern goshawks are susceptible to human disturbance; human activity was twice as high within infrequently occupied territories as compared to frequently occupied territories. Many kinds of human activities have been documented to affect raptors by altering habitats, physically harming or killing eggs, harming young, killing or stressing adults, or by disrupting normal behavior (Postovit and Postovit 1987, Delany et al. 1999 as cited in Morrison et al. 2011). A recent study on nesting northern goshawk response to logging truck noise found that while goshawks alerted (turned their head in the direction of the noise) to the noise they did not flush and response was inversely proportional to the distance of the nest from the road (Grubb et al. 2012).

In summary, northern goshawks in California are well-distributed and relatively abundant in most forested areas across their core breeding range, and populations have remained stable over the past 50 years. Goshawks use a broad range of vegetation types, and habitat on national forests in California is widespread and well distributed. Goshawks possess excellent dispersal capabilities, and there are no identified barriers to dispersal. Potential threats to goshawk include habitat loss from wildfire and climate change. Effects from wildfire vary greatly, depending on fire severity. Goshawk populations may be influenced by climate change in the future, however, there is significant uncertainty about how goshawk populations might respond to changing habitat conditions.

Sequoia Forest-specific Rationale:

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012 and is included here for reference only.

Information on current distribution of the species on the planning unit

There are 27 Northern goshawk PACs in total (Figure 3), with 13 PACs occurring within the forest plan revision area and the others occur within the Giant Sequoia National Monument boundary. The number of active territories is unknown. There are 357 detections of northern goshawk in the NRIS database reported as occurring on the Sequoia National Forest, which does not separate those that have occurred in the forest plan revision area from those occurring within the boundary of the Giant Sequoia National Monument. The observations occurred between 1991 to present.

Key ecological conditions for this species (See above for additional details)

Northern goshawk is found in dense mature mixed conifer to lodgepole pine and deciduous forests interspersed with meadows, other openings and riparian areas (2000-8000 ft). Goshawks are foraging generalists but have more specialized habitat requirements for breeding and prefer higher canopy closure and groups of larger trees. Nest sites comprise < 1% (0.12 km2) of the total goshawk home range and

have relatively low vegetative structural diversity compared to forest conditions in their large home ranges, which is used for foraging, roosting, and by juvenile hawks post-fledging (Reynolds et. al. 2006).

Potential habitat (excluding private land) available to northern goshawk on the Sequoia National Forest, as defined by the California Wildlife Habitat Relationships (CWHR) is displayed in Table 7. Approximately 278,775 acres of forest are classified as having dense cover (60-100 % closure) while 269,532 acres have moderated cover (40-59 %) and 122,031 acres (25-39%) have open cover. There are approximately 124,744 acres of forest containing CWHR size classes > 24 inches and 427,450 acres containing small trees 11-24 inches in diameter. (Sequoia assessment 2013-chapter 1 snapshot).

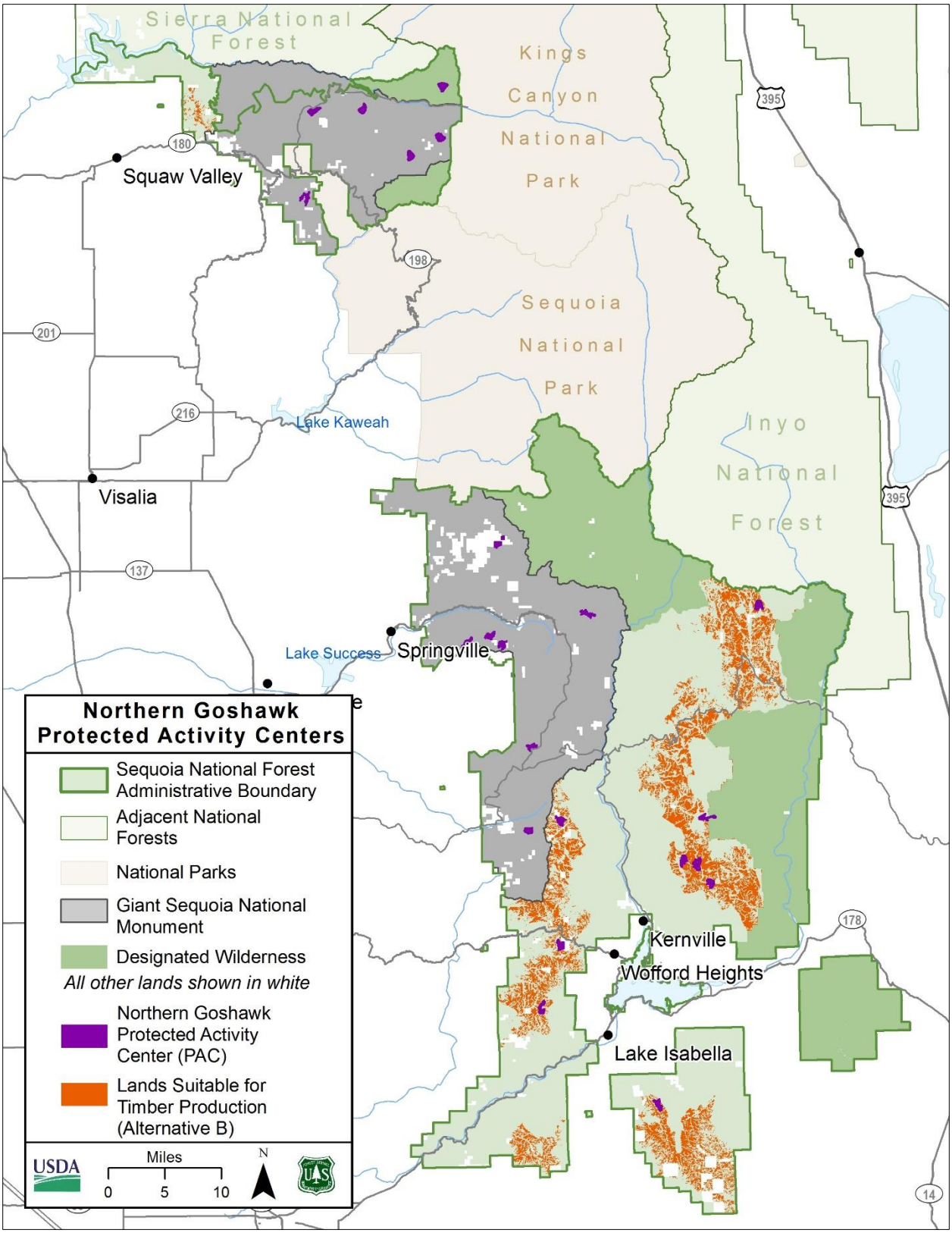

Figure 3. Northern goshawk protected activity centers (PAC) on the Sequoia National Forest.

Table 7. Acres of potential habitat (excluding private land) available to northern goshawk on the Sequoia National Forest, as defined by the California Wildlife Habitat Relationships (CWHR)

CWHR Habitat Type	Acres
Montane Hardwood-Conifer	39,211
Red fir	105,801
Ponderosa Pine	27,556
Sierran Mixed Conifer	229,423
Jeffrey Pine	50,112
White Fir	2,853
Wet Meadow	4,424
Aspen	22
Lodgepole pine	15,471
Montane Riparian	5,976
Total	480,849

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Montane Zone

Composition, structure, and fire regimes have changed considerably since pre-settlement times (Van de Water and Safford 2011), and are largely outside the natural range of variability in the Greenhorn Mountains. Pines and oaks have decreased substantially and shade tolerant species, such as cedar and fir, have increased.

Compared to past conditions, forest density is greater, tree canopy is denser, and small and medium trees are more dominant in the forest. Within stand variation in tree size and density has decreased. Drought has triggered tree mortality in mixed conifers; and large tree mortality has doubled in the last 2-3 decades across the western United States. This pattern is associated with increases in temperature and droughts.

Large Trees and Snags

Large tree density varies considerably by forest type. High elevation red fir, lodgepole pine and Jeffrey pine forests have relatively high mean or median densities. Trees greater than 30 inches in diameter are generally four trees per acre or more. The coefficient of variation (COV), a measure of how variable those numbers are is 122 percent. This means that the densities vary radically across the landscape. Although mean or median levels are moderate in these forest types, the coefficients of variation are often high. Prior to the insect related mortality event (Figure 4), mixed conifer forests had moderate but highly variable densities of trees greater than 30 inch diameter, with trees greater than 40 inch diameter sparse. These forests occur on more productive sites and trees greater than 40 inches in diameter were once more common. In ponderosa pine dominated forests, large trees (diameter greater than 30 inches) are less common and highly variable in occurrence, with mean and median densities of 2.8 and 2.0 trees per acre respectively. Hardwood-conifer and hardwood forests have relatively high densities of trees greater than 21 inch diameter (2 to 18 trees per acre) but the levels are highly variable. Densities of snags greater than 15 inches follow similar patterns by forest type but with levels at least 100 percent lower.

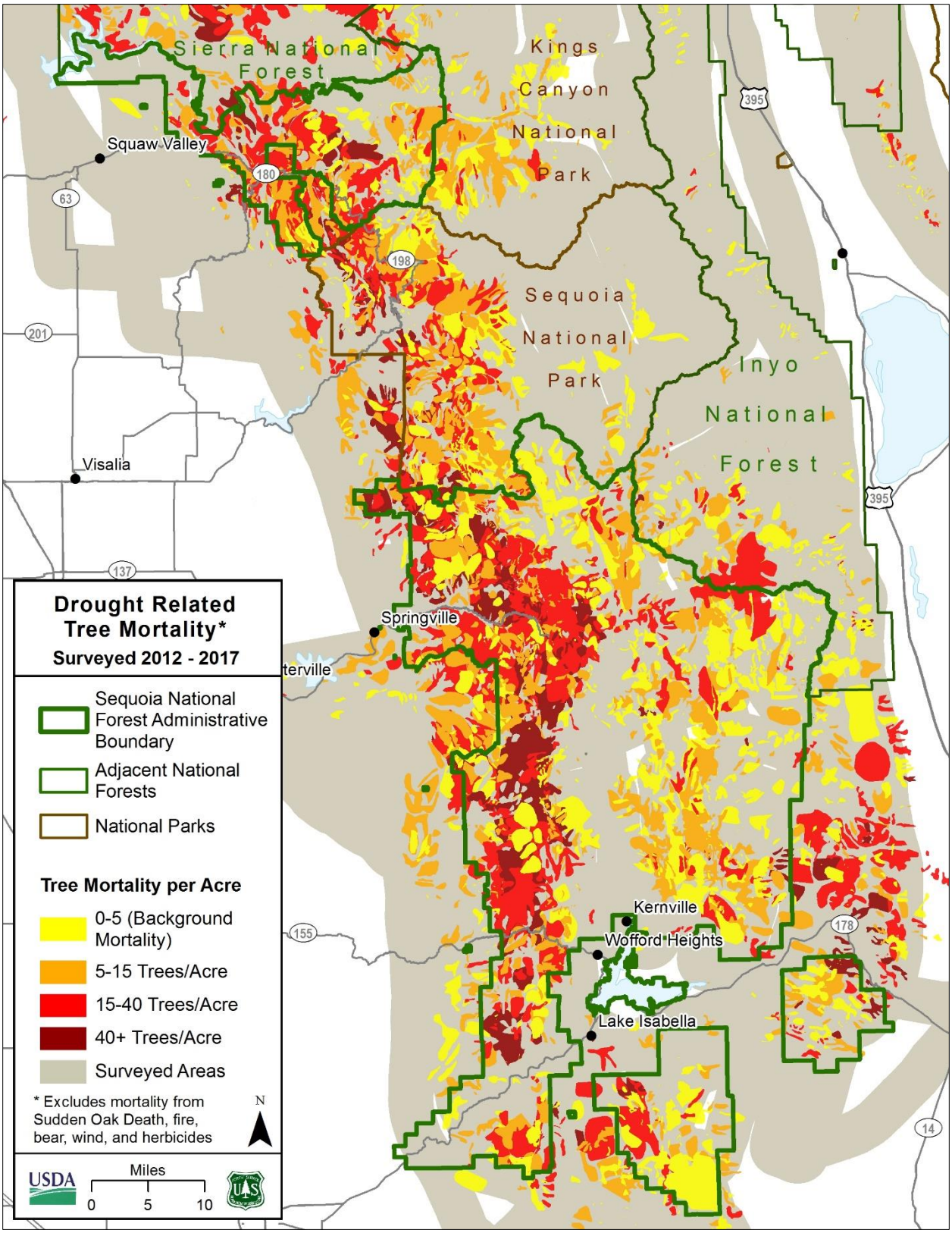

Figure 4. Drought and insect-related mortality through 2017 in the southern Sierra Nevada based on aerial detection surveys

Structural Heterogeneity

Variation in basal area was calculated on the Sequoia National Forest using Forest Inventory and Analysis (FIA) data. Almost all forest plots had low within-stand variation. Large areas of high severity fire can reduce important forest structures such as large trees with cavities and mature mast-producing hardwoods. Northern goshawk require areas with sufficient overstory and understory cover and uncharacteristically severe wildfire can reduce tree cover, fragment these areas and create barriers to animals traveling across heavily burned areas. These same key habitat elements can be affected by planned management activities.

While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sequoia National Forest, substantial areas are at a low and very low fire resiliency index, indicating they are susceptible to higher amounts of crown fire than expected.

The Sequoia and Sierra National Forests have been experiencing extreme drought and insect (e.g. bark beetles, fir engravers) related tree mortality (Pile et al. 2018, Restaino et al. In press, United States Department of Agriculture 2017). The impact on the Sequoia National Forest is demonstrated in Table 8, Table 9, and Figure 4. Mortality has occurred across all major conifer types, especially mixed conifer, Jeffrey pine, red fir and ponderosa pine. Statewide trends in 2017 were of mortality at higher elevations, in white and red fir, compared to previous years where extensive mortality occurred in lower elevation pine and mixed conifer forests. In 2016, the eastern edge of the Sequoia and Sierra NFs along with nearby private lands, the Piute and Scodie Mountains of the far southern Sequoia National Forest and private lands along the Tehachapi Range areas were most affected. All conifer species were affected by their associated bark beetle species. Preliminary analysis of tree mortality data from plot surveys in areas affected by drought, warmer temperatures, and bark beetle outbreaks indicate pine mortality on the Sierra National Forest of over sixty percent (Meyer 2018), and impact in tree mortality areas on the Sequoia National Forest may be similar.

Table 8. Estimated drought and bark beetle related mortality

Year	Estimated Acres of Mortality	Estimated Number of Dead Trees
2014	91,400	322,973
2015	387,000	6,130,000
2016	391,000	10,147,000
2017*	185,000	3,480,000

Preliminary estimates

Table 9. Acres of insect and disease related mortality by tree type on the Sequoia National Forest.

Host	2012	2013	2014	2015	2016	2017
Mixed conifers, California	None	1,500	1,400	47,000	112,700	11,500
Jeffrey pine	1,900	6,000	10,900	35,000	22,800	27,900
White fir	1,700	900	700	25,700	20,800	9,200
Major pine type group	None	None	None	33,800	22,800	None

Host	2012	2013	2014	2015	2016	2017
Ponderosa pine	1,300	2,500	5,600	21,500	9,400	12,700
California red fir	100	1,600	2,700	None	2,200	45,800
Singleleaf pinyon	None	500	1,800	29,900	5,100	None
Lodgepole pine	5,100	1,200	4,500	20,800	500	None
Fir	None	None	None	None	5,100	300

The projected status of those ecological conditions relative to the species considered

Fire

According to the recent fire resilience assessment, (Fites-Kaufman et. al. 2007), low and mid-elevation mixed conifer, pine, and foothill areas are mostly low to very low resilience under all weather conditions. Under hotter, drier and windier conditions all the mid and lower elevations have low to very low resilience to fire and would be prone to high severity fire and high levels of tree mortality. On the Kern Plateau, however, Jeffrey pine and eastside mixed conifer forests have variable fire resilience and tend to be drier and more open, with slower rates of fuel accumulation-overall fire resiliency is higher. This greater resiliency may reflect the lower fuel loading, lower moisture stress, and greater use of wildland fire for resource benefit in forest ecosystems on the Kern Plateau.

According to the National Report on Sustainable Forests (USFS 2004), there is a high possibility of increased high intensity fire (resulting from climate change) that could decrease old forest and increase early seral habitat having cascading effects on patch diversity. Expected changes in climate and fire could lead to increased fragmentation of old forest and decreased fragmentation for early seral forest. With the exception of 2017, tree mortality has steadily increased the last several years, creating the potential for additional roosting habitat as a result of insect outbreaks and irruptions, but see related discussion above under fire for potential long term affects.

Moisture stress and the frequency and severity of bark beetle outbreaks are projected to increase dramatically with increasing temperatures in the Sierra Nevada, resulting in widespread tree mortality (Bentz et al. 2010, Hicke et al. 2006). Bark beetle outbreaks began to occur over much of the Sierra and Sequoia National Forests in ponderosa pine, lower elevation mixed conifer forests, and then red fir forests. The amount of dying conifers is moderate to very high in many areas. These levels are greater than what has occurred in the last 50 years. In 2012, future projections had estimated that bark beetle and other forest insect activity will increase because of changes in climate such as elevated temperatures, frequent drought, and current high risk conditions (dense vegetation) of Western forests (Bentz et al. 2010). Forest health monitoring risk maps (USDA FS 2012b) showed substantial risk of increased tree mortality (greater than 25 percent basal area lost) over a 15 year time period due to bark beetles and other pest complexes. Droughts may become frequent and prolonged, and it can be expected that mortality will be proportional (Smith 2007). Warming and drying climate are expected to greatly increase the likelihood and risk of widespread and elevated insect and pathogen outbreaks (Fettig 2012).

In summary, anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. In addition, projected increases (2006-2050) in

mountain pine beetle activity for high-elevation white pine forest will have substantial cascading impacts on subalpine forest ecosystems, leading to outbreaks that can cause significant changes in forest structure, function, and composition (Meyer 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

Spatial configuration of large trees and snags.

Key risk factors arising from non-ecosystem conditions and/or management activities

Forest Management

Insect outbreaks and the resulting loss in canopy cover may be a limiting factor for goshawks at the nest stand. Dickson et al (2014) found canopy-base height (> 46 ft), canopy bulk density along with Northeast aspect to be the strongest positive predictor variables of goshawk occupancy at the territory scale in Arizona. High canopy bulk density may provide protection from predators at the nest and also habitat availability for several goshawk prey species. They found a strong negative relationship between occupancy and density. Using the same territory occurrence model Ray et al (2014) found that forest treatments comprised of thinning and prescribed fire in ponderosa pine forest were relatively minor compared to stand-replacing fire which had occurred in the same area. Their study demonstrated active forest restoration is necessary in order to avoid the more pronounced and widespread degradation or loss of habitat.

Reynolds et al (2016) assessed the effects of mixed fire severity on goshawk productivity in the Warm Fire footprint, a 235 km2 fire that burned in 2006 in ponderosa pine and mixed-conifer forests. The focus of their study was to assess how low- and high-fire severity affected nest survival and productivity. They assessed post fire activity at 20 territories in areas of high and low fire severity. They found that territories that lost more than 75% of the forest to moderate and high severity fire were not reoccupied, and that territories that lost between 50-75% of the forest to moderate and high severity had only 43% reoccupation following the fire. Post-fire occupancy of a nest area in a burned territory depended on the availability of at least 1 alternate nest stand in the territory that had escaped high severity fire. Their study demonstrates management strategies for mixed fire.

It is reasonable to conclude severe decreases in canopy cover resulting from extensive bark beetle tree mortality may have similar effects as severe tree mortality caused by fire on goshawk productivity. However, there may be differences in timing. Newly bark beetle killed trees (snags) begin to deteriorate at rates that depend for the most part on tree species and size: small-diameter (<38 cm dbh) snags fall faster than large-diameter snags; and pines fall at faster rates than firs (Raphael and Morrison 1987). In general, dead trees typically lose all needles and twigs within five years and lose majority of larger limbs within five years.

In the short-term, trees killed by bark beetles turn into snags that remain on site and may provide short-term habitat (years 4-5); canopy cover is eventually reduced and nest sites will experience greater exposure. Prey species composition is expected to change in beetle-killed stands, including short-term changes in small mammal and bird densities; as tree mortality occurs woodpeckers and secondary cavity nesting birds are expected to increase providing alternative prey as small mammal populations decline. Reports in Utah (Graham et al. 1999) and Colorado (Skorkowsky 2007) suggest that goshawk productivity in the short-term was not affected by severe bark beetle caused overstory tree mortality; Graham et al. (1999) summarized there were no major differences in fledgling rates for goshawk nesting in lodgepole pine forest that had experienced up to 80% overstory mortality from bark beetles. Similarly, on the Dixie National Forest in southwestern Utah, nesting territories located in areas with high mortality

caused by spruce bark beetle remained active (Dixie National Forest 1997). However, Graham et al. (1999) also suggested low use of ponderosa pine habitat in Utah was likely caused by the absence of large trees for nesting, due to past harvesting practices.

The rate of tree fall will increase over time (Raphael and Morrison 1987) and quality nest area habitat may decline. Individual trees, starting with pine, will begin to snap off at the top, or completely fall as roots decompose. Sites capable of supporting successful goshawk nesting may become limited and competition for suitable territories may increase between goshawks and other forest raptor species. Shade tolerant species in the understory that were not affected by bark beetles will begin to release. More recent research suggests widespread insect outbreaks and associated mortality may not provide the positive effects that occur as result of large fires, such as increases in understory regeneration and ecological release of shade intolerant species (Stephens et.al. 2018). This could have negative effects on goshawks small mammalian prey base.

Climate Change

Terrestrial ecosystems of the Sierra NF are expected to experience dramatic changes in climate in the coming decades (Meyer and Safford 2013, Safford et al. 2012). Consequently, the future range of variation in climate exposure for these ecosystems will almost certainly exceed the NRV. Schwartz et al. (2013) evaluated future climate exposure to vegetation using downscaled climate projections for the southern Sierra Nevada, including the Sierra and Sequoia National Forests. Their results indicate a high proportion of all terrestrial ecosystems used by northern goshawk will be moderately, highly, or extremely vulnerable to future climate by the end of the century (Refer to table 63 in the DEIS).

Effects from climate related change and variable precipitation brought on by El Nino and La Nina have the potential to negatively affect goshawk productivity. Reynolds et al (2017) recently analyzed a 20-year data set on goshawk demography on the Kaibab Plateau in Northern Arizona. They concluded that climate change-related drought effects on prey abundance coupled with the risk of habitat loss from stand replacing fire to be primary threats (Reynolds et al 2017). This study reinforces previous work by Salafsky et al. (2005) who found that while goshawks readily exploited a variety of different prey species, their overall productivity was greatly driven by differences in the densities of several key prey species. Similar factors may also be relevant to the Sequoia National Forest goshawks and their prey base as climate change effects become more prevalent.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

There are 13 northern goshawk PACs within the plan revision area, the active territories are unknown. Recent population estimates for goshawk in California suggest a stable to increasing trend, but recent widespread bark beetle related tree mortality in the Sequoia National Forest plan area put this species primary ecological conditions at risk. Climate change and potential drought related effects will likely exert additional pressure on the key ecological conditions that this species depends, though it is hard to predict what long term role these stressors will have on the species' ability to persist in the planning unit over time. Based on the consideration of all these factors there is sufficient information to demonstrate substantial concern for long-term persistence in the plan area. Based upon the evidence and supporting best available science, the northern goshawk does meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Tricolored blackbird - *Agelaius tricolor*

Type of Animal: Bird

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern:

Yes

Relevant threats to species:

Threatened by draining and conversion of wetlands and upland breeding habitats.

Rationale for tricolored blackbird:

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: S1S2

Other Designations: CA Threatened; CA-SSC; CA-SGCN; USFWS-BCC; BLM-SS

The tricolored blackbird has a global ranking of G3G4, indicating there is a range of uncertainty, and its status is between Vulnerable "at moderate risk of extinction due to a restricted range, relatively few populations, recent and widespread declines, or other factors" and Apparently Secure "uncommon but not rare; some cause for long-term concern due to declines or other factors". The ranking of S1S2 in California also indicates a range of uncertainty between Critically Imperiled "extreme rarity or because of some factors such as very steep declines making it especially vulnerable to extirpation from the state" and Imperiled "rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the state". (NatureServe 2015).

The available scientific information is generally in agreement that tricolored blackbird populations are declining in California. Breeding Bird Survey data from 1966-2013 indicates a decline in populations of -0.59% per year and a greater decline more recently of -2.24% per year from 2003-2013 (Sauer et al. 2014). Christmas Bird Count data from across the species entire range show an increase from 1966-2013 (+1.4% per year, 95% CI: -1.8-4.0) (Soykan et al. 2016). In breeding areas across their range, tricolored blackbirds declined by 63% from 1935-1975, and from 1980 onwards there was no statistically significant change in population size (Graves et al. 2013). Conversely, data collected in 2008, 2011, and 2014 during three extensive California surveys of tricolored blackbirds showed large declines (-64% from 2008-2014 and -44% from 2011-2014) (Meese 2014).

Loss and degradation of wetland breeding habitats caused by human activities represent the greatest threat to populations of tricolored blackbird (Beedy 2008, Meese 2014). Historical populations, especially in the Central Valley, are thought to have been much larger before conversion of the extensive marshes to agriculture (Beedy 2008). Winter habitats, located primarily in coastal agricultural fields, do not appear to be threatened (Beedy 2008).

Extensive draining and anthropogenic modification of historical marsh habitat appears to have abated in past 50 years due to conservation concerns (La Peyre et al. 2001). Current threats to remaining breeding habitat include continued conversion of native habitats to agricultural fields, pastures, and (especially) vineyards; contamination of wetlands with toxins that at times results in mass mortalities (deliberate poisoning occurred up until the 1960s but has been stopped); and pesticide spraying near colonial areas with herbicides and insecticides for mosquito abatement—resulting in reproductive failure (Beedy 2008, Meese 2014). Agricultural pesticide use has also reduced insect levels that tricolored blackbird depends on during the breeding season. Reduced insect levels have caused tricolored blackbirds to shift to a diet of grains, which do not provide sufficient nutrition. This shift in diet may be the cause of reduced reproductive success for nesting colonies in agricultural areas of California (Meese 2014).

Tricolored blackbirds have adapted to using certain agricultural crop fields (particularly cereal and silage) and ill-timed harvesting of these crops has eliminated entire nesting colonies, but recent management efforts have served to protect these colonies by providing incentives to farmers not to harvest these crops at critical times (Beedy 2008). Conversion of upland habitat (especially Himalayan blackberry thickets within open pastures) used by some nesting colonies, has led to reductions in population size (Cook and Toft 2005). Recent declines in the tricolored blackbird populations in California may also stem from lack of water due to several years of drought (Meese 2014). Climate change could increase the risk of drought in the future which could threaten some wetland habitats (Diffenbaugh et al. 2015).

An unknown number of adult tricolored blackbirds are killed each year when red-winged blackbirds (*Agelaius phoeniceus*) are shot while causing depredations to ripening rice in the Sacramento Valley. The two blackbird species are extremely similar in appearance and flock together. Red-wing blackbirds may be legally shot while depredating crops, and tricolored blackbirds are inadvertently shot along with the red-winged blackbirds (Meese 2014).

While declining populations and threats to tricolored blackbirds are a conservation concern in California, these threats to tricolored blackbirds are associated with habitat and populations on private land. Populations on National Forests do not face the threats of draining and conversion of wetlands for agriculture, pastures and vineyards. Insecticides are not applied on National Forests to control mosquitos and to reduce agricultural pests. Nest destruction and associated egg and nestling mortality during agricultural crop harvests are not experienced on National Forests. There is no shooting of red-winged blackbirds and associated collateral killing of tricolored blackbirds feeding on agricultural crops on the National Forests as occurs on private agricultural lands.

One exception facing populations across all ownerships is climate change. There is a higher probability that California will experience warmer and dryer conditions in the future (Diffenbaugh et al. 2015). The impact that climate change may have on marsh habitats in the future is unclear. It is also unclear what if any effect climate change would have on tricolored blackbird populations, as many colonies now use upland habitats for nesting.

Forest-Specific Rationale

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012 and is included here for reference only.

Information on current distribution of the species on the planning unit

The blackbird's historic breeding range in California included the San Joaquin Valley and the foothills of the Sierra Nevada south to Kern County, and up to 3,400 feet in Walker Basin (Grinnell and Miller 1944). Within the Sequoia National Forest, breeding colonies have been recorded only in marshes around Lake Isabella and the Kern River.

In eBird, there are 77 sighting of 1186 tricolored blackbirds within the forest administrative boundary, with nearly all occurring in the plan area, in the Lake Isabella area and east of Lake Isabella along the Kern River/Kern River Preserve and State route 178. CNNDB data includes three records of tricolored blackbird in the vicinity of Lake Isabella on the Kern River RD, with possible nesting attempts as recent as 2015. There are no records in the NRIS database.

Statewide, the population of tricolored blackbirds declined 35 percent, from approximately 395,000 to 258,000 birds between 2008 and 2011 (Kyle and Kelsey 2011). From 2011 to 2014 the number of tricolored blackbirds dropped another 44 percent, from 258,000 to 145,000 birds (Meese et al. 2014). The eBird sightings in the plan area include many from 2014 through 2017.

Key ecological conditions for this species (See above and species account for additional details)

The species' basic requirements for selecting breeding sites are open accessible water; a protected nesting substrate, including either flooded or thorny or spiny vegetation; and a suitable foraging space providing adequate insect prey within a few kilometers of the nesting colony (Beedy and Hamilton 1999). Historically they used freshwater marshes and emergent wetlands with dense vegetation including aquatic sedges (tules) and cattails for nesting.

Potential habitat (excluding private land) available to tricolored blackbird on the Sequoia National Forest, as defined by the California Wildlife Habitat Relationships (CWHR) is described in Table 10.

Table 10. Potential habitat (excluding private land) available to tricolored blackbird on the Sequoia National Forest

CWHR Habitat Type	Acres
Wet Meadow	4,424
Montane Riparian	5,976
Valley Foothill Riparian	457
Total	10,857

On the southern portion of the forest, below Lake Isabella reservoir, the Kern River separates the Breckenridge Mountains from the Greenhorn Mountains. The Kern River drains the southern and eastern portions of the Greenhorns and is impounded at Lake Isabella. Upstream from the reservoir, the South Fork of the Kern River divides the Piute Mountains and Scodie Mountains from the Kern Plateau. The North Fork of the Kern River divides the Greenhorn Mountains from the Kern Plateau.

Six hydroelectric projects are located on the forest, four on the Kern River, and two on the Tule River. These hydroelectric projects are run off of the rivers, but do influence the flows and timing of flows of the rivers.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Meadow Habitat

The total area of meadows in the Sierra Nevada has decreased due to past and current land use practices such as dams, diversions, and recreation; upland vegetation encroachment from conifers and sagebrush as a result of fire suppression; or from drying due to stream channel incision (Gross and Coppoletta 2013).

Monitoring plots have been established for key area meadows under the Region 5 Range Long Term Monitoring Project. These plots are used to monitor rangeland condition and trend and the plots are re-read on a 5 year cycle. The plot locations are non-randomly selected and are located in areas within the meadow most likely to show change and transition. Generally, wetter meadows are in better condition than dry meadows most of the meadows sampled were in the mesic or wet meadow type.

Lakes/Water

Surface water resources for the Sequoia National Forest are predominately in the Kern and Tule Rivers. Flows from Sequoia National Forest streams have been highly variable over the span of several decades. Natural variation in flow is due to the long and short term climate cycles that influence precipitation. Timing of peak flows from snow melt is earlier than it was ten years ago, and reflects warmer than normal spring temperatures (Stewart 2009, Hunsaker et al. 2013).

The Sierra Nevada Ecosystem Project (SNEP 1996) that the aquatic/riparian systems of the Sequoia National Forest were the most altered and impaired habitats of the Sierra Nevada. Three impaired functioning watersheds from the Watershed Condition Classification in the Plan Area are: Isabella Lake (Kern River), Isabella Lake (South Fork Kern River).

According the recent assessment, 43 percent of watersheds were properly functioning, 52 percent were “functioning at risk”, and five percent had” impaired” function. Habitat fragmentation, flow alteration,

exotic species, road density, and road proximity to water were the most common stressors affecting watersheds that were not properly functioning

Water quality and quantity are at present well within the natural range of variability in most areas of the forest. However, climate change is a stressor which may limit water quality and quantity in the future. Watersheds are overall in good condition, and most are able to recover from most perturbations imposed by human influence or are within the natural range of variability. A few are impaired due to water withdrawals or impoundments. Invasive species, fire, and climate change remain stressors on watershed condition.

The projected status of those ecological conditions relative to the species considered

Groundwater is dependent on snow melt to recharge and since snowmelt occurs earlier and the elevation of snow may increase, where and when groundwater recharge occurs may change. Stream and lake levels may be influenced by spring runoff of snowmelt; low summer/fall flows; drought; or drawdown of hydroelectric reservoirs in the fall. This can cause a temporal mismatches and availability of nesting habitat availability wetland dependent species.

Future changes in climate (i.e. increasing temperatures) combined with a change from a snow-dominated to a rain-dominated system will impact meadows due to changes in the hydrologic regime. Total meadow area may decline and wet meadows may shift to dry meadows, especially small irregularly shaped meadows at low to mid elevations (Gross and Copoletta 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

The greatest effects to this species are related to habitat loss and alteration with virtually all suitable habitats being converted by agriculture and urbanization (Meese et al. 2014). This does not occur on the national forest. In the limited habitat for this species on the Sequoia National Forest, loss of tules or cattails to invasive species like tamarisk is a major threat. Changes in water levels at Lake Isabella may also be a threat, but regulating those levels is outside the authority of the Forest Service.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Tricolored blackbird was made a candidate species under California Endangered Species Act, effective January 08, 2016 with many of the concerns focused on grain fields and nesting colonies in areas of agricultural production. This species occurs on the Sequoia National Forest in extremely low numbers and statewide populations are in decline. Suitable habitat on the Sequoia National Forest is limited to the shores of Lake Isabella and surrounding vicinity. Water use from expanding population pressure and human demands, coupled with increasing temperatures and temporal changes in precipitation and runoff events related to climate change, as well habitat loss from non-native invasive species will continue to put this species and its associated habitat components at risk in the future. *There is substantial concern about this species ability to persist on the planning unit.* Based upon the evidence and supporting best available science, Tricolored blackbird meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered:

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USDA 2016. Draft Environmental Impact Statement for Revision of the Inyo, Sequoia, and Sierra National Forests Land Management Plans. Volume 1: Chapters 1 through 4, Glossary, References, and Index. Pacific Northwest Region. 740 pp.

Willow Flycatcher - *Empidonax traillii* (includes: *Empidonax traillii brewsteri and Empidonax traillii adastus*)

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Nest predation, parasitism, breeding habitat degradation, and loss from management practices such as grazing, road construction, and water diversion.

Rationale for willow flycatcher

NatureServe Global Rank: G5

NatureServe T Rank: T3T4

State Rank: S1S2

Other Designations: CA-SGCN; CA-SE; FS-SS; USFWS-BCC

The willow flycatcher (*Empidonax traillii*) has a global rank of G5, a California State rank of S1S2, is recognized as a species of greatest conservation concern, and is listed as endangered under the California Endangered Species Act. *E.t. adastus* has a global subspecies rank of T5 and *E.t. brewsteri* has a global subspecies rank of T3T4. The willow flycatcher is a Region 5 Forest Service sensitive species.

Generally, *E.t. brewsteri* breeds in isolated patches in northern California and along the western slope of the Sierra Nevada and *E.t. adastus* breeds along the eastern slope of the Sierra Nevada and western Nevada. Since the boundary between *brewsteri* and *adastus* is indistinct, this rationale treats both subspecies simultaneously.

Green and others (2003) report population estimates for willow flycatchers in the Sierra Nevada range from 300-400 individuals with about 120-150 individuals occurring on National Forest System lands. While breeding bird surveys across the state of California indicate a non-significant increase in willow flycatcher numbers between 1966 and 2013, available data suggests a substantial decline has been reported for willow flycatchers in the Sierra Nevada over the past 40 years, resulting in the absence or near absence from many historically occupied areas.

Willow flycatcher migrants occur throughout California while breeding residents occur in the Sierra Nevada. Migrants occur in a variety of open habitat types and are not as dependent on the integrity of any specific habitat or location. Breeding habitat consists of riparian stringers and meadow habitats at least 0.4 ha in size with saturated soils and dense shrubs (Green et al. 2013). Breeding birds are primarily associated with willow thickets 3-7 meters tall within or adjacent to meadows or forest clearings. They are less frequently found in riparian corridors dominated by other types of riparian shrubs. Most willow flycatcher nests are located in the lower branches of riparian shrubs, typically below 1.5 m (5 feet) (Fowler et al. *in* Green et al. 2003).

Loss and degradation of riparian and meadow habitat is considered the most significant threat to the persistence of willow flycatchers in the plan area. Degradation of habitat from management practices including livestock grazing (historic and present), road construction, and water diversion have resulted in a reduction (i.e., loss) of willow habitat, as well as compaction and drying of meadows. Drought and climate change are known to influence long-term patterns in meadow condition such as reductions in willow habitat; however, the recent declines in willow flycatcher population numbers and degradation of suitable breeding habitat have likely been accelerated due to anthropogenic factors (Green et al. 2003). Evidence of this is a large number of meadow sites that no longer support breeding willow flycatchers

(Green et al. 2003). Habitat conditions on wintering grounds and along migration routes may be contributing to population declines; however, survival rates and return rates of individuals in the Sierra Nevada are similar or better than in other regions (Green et al. 2003). Restoration efforts that result in as little as a 10 percent increase in riparian shrub cover in meadows increases the likelihood of occupancy and nest success for willow flycatchers (Bombay 2003).

Livestock grazing has been documented to remove willow cover (Taylor 1986) and cattle occasionally knock down nests (Valentine et al. 1988). Livestock damage such as compaction and pedestalling can alter soil infiltration and water holding capacity in localized areas, resulting in drier meadows that either reduces or eliminates willows and therefore would not continue to support breeding willow flycatchers. While there is still debate over the correlation between livestock grazing and willow flycatcher status, there is evidence of past severe impacts to meadow habitat from livestock (Ratliff 1985).

Water diversions that result in a reduction of riparian vegetation, particularly willows, from either reduced water availability or inundation of riparian areas effectively degrade habitat quality for willow flycatchers. Recreation activities near breeding territories including hiking, camping, fishing, and off-road vehicle use can negatively affect flycatchers. Affects may include noise disturbance and increased risk of predation through the attraction of jays and squirrels, known predators, to food scraps and garbage that accompany public use. Roads near meadow and riparian habitat that alter the hydrologic function of these adjacent features can result in degrading habitat through dewatering or drying of meadows and riparian zones (Kattelmann 1996) and increased sedimentation that can have deleterious effects to aquatic invertebrate prey (Erman 1977 *in* Green et al. 2003).

Nest predation is common and is considered a likely factor most affecting population viability in the Sierra Nevada (Bombay 1999, Cain et al. 2003). Predators include milk snakes, common king snakes, red tailed hawks, weasels, chipmunks, and squirrels. Standing water around nests is considered a deterrent to mammalian predators and nests farther from trees exhibit higher nest success (Cain et al. 2003). Similarly, (Bombay et al. 2003) found that nests success increased with increasing distance from trees. Maintaining standing water or saturated soils in meadow habitat would contribute to promoting willow thickets and preventing conifer encroachment, resulting in favorable breeding conditions for willow flycatchers.

Brood parasitism from brown-headed cowbirds is also identified as a threat to willow flycatchers. Brown-headed cow birds have a commensal relationship with domestic livestock. Rates of parasitism are variable and may affect flycatcher productivity at the local level (Green et al. 2003).

Forest-Specific Rationale

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012 and is included here for reference only.

Information on current distribution of the species on the planning unit

There are 64 records of 82 individual willow flycatchers in eBird for the Sequoia National Forest, but this also includes those on the Giant Sequoia National Monument. There are recent willow flycatcher reports scattered throughout the forest: in Tulare County there are records from the Greenhorn Mountains and meadows on the Kern Plateau; and in Kern County there are records south of Kern Peak at Kern Flat and Lloyd Meadow, and in the vicinity of Lake Isabella and along the Kern River (Kern River Preserve, South Fork Wildlife Area). The sightings in Lake Isabella area are presumed to be the endangered *extimus* subspecies, and willow flycatchers detected outside of this area and in the montane forests may be

brewsteri, but identity has not been confirmed. A third subspecies, *E. t. adastus*, was known on the east side of Sierra Nevada and may or may not have occurred on the Sequoia National Forest.

There were six sites considered "occupied" on Sequoia National Forest under the 2004 Sierra Nevada Forest Plan Amendment (USDA 2004). Five of those sites are within Giant Sequoia National Monument and one is in the Sequoia National Forest Plan area. Although willow flycatcher was detected during monitoring in the Monument in 2009, the last detection during monitoring in the plan area was in 2001, despite repeated surveys. Flycatcher surveys are conducted using standardized protocol (Bombay et al. 2003). The willow flycatcher site in the plan area, Troy Meadow, has not been occupied since 1997. Follow-up visits for detections at other sites listed as occupied in the 2004 Framework have been negative, with no evidence of birds persisting through the breeding season.

To summarize, there have been no detections in the plan area since 2001. The status of willow flycatcher subspecies on the Sequoia National Forest is not well understood because they are difficult to differentiate from the federally listed southwestern willow flycatcher species in the field.

Key ecological conditions for this species (See above for additional details)

Willow flycatcher is found in western Sierra Nevada's willow dominated riparian areas, including moist meadows with perennial streams and smaller spring-fed or boggy areas (2000-8000 ft.) Standing water is important. Potential habitat (excluding private land) available to willow flycatcher on the Sequoia National Forest, as defined by the California Wildlife Habitat Relationships (CWHR) is described in Table 11.

Table 11. Potential habitat available to willow flycatcher on the Sequoia National Forest

CWHR Habitat Type	Acres
Wet Meadow	4424
Montane Riparian	5976
Valley Foothill Riparian	457
Total	10,857

There are an estimated 556 meadows encompassing about 10,000 acres or ten percent of the total acres of the Sequoia National Forest. These meadows are unevenly distributed across the landscape, scattered throughout the forest, except in the Kings Canyon inner gorge and between the Tule Reservation, north to the boundary of Sequoia National Park.

Four major rivers drain parts of the Sequoia National Forest. The Kings, Kaweah, and Tule Rivers flow almost due west through deep canyons in the northwestern portion of the Greenhorn Mountains. Several smaller watersheds such as Deer Creek or White Creek flank the western side of the Greenhorn Mountains. On the southern portion of the forest, below Lake Isabella reservoir, the Kern River separates the Breckenridge Mountains from the Greenhorn Mountains. The Kern River drains the southern and eastern portions of the Greenhorns and is impounded at Lake Isabella. Upstream from the reservoir, the South Fork of the Kern River divides the Piute Mountains and Scodie Mountains from the Kern Plateau. The North Fork of the Kern River divides the Greenhorn Mountains from the Kern Plateau.

Six hydroelectric projects are located on the forest, four on the Kern River, and two on the Tule River. These hydroelectric projects are run off of the rivers, but do influence the flows and timing of flows of the rivers.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Meadow Habitat

The total area of meadows in the Sierra Nevada has decreased due to past and current land use practices such as dams, diversions, and recreation; upland vegetation encroachment from conifers and sagebrush as a result of fire suppression; or from drying due to stream channel incision (Gross and Coppoletta 2013).

Monitoring plots have been established for key area meadows under the Region 5 Range Long Term Monitoring Project. These plots are used to monitor rangeland condition and trend and the plots are re-read on a 5 year cycle. The plot locations are non-randomly selected and are located in areas within the meadow most likely to show change and transition. Generally, wetter meadows are in better condition than dry meadows most of the meadows sampled were in the mesic or wet meadow type.

The projected status of those ecological conditions relative to the species considered

Groundwater is dependent on snow melt to recharge and since snowmelt occurs earlier and the elevation of snow may increase, where and when groundwater recharge occurs may change. Stream and lake levels may be influenced by spring runoff of snowmelt; low summer/fall flows; drought; or drawdown of hydroelectric reservoirs in the fall. This can cause a temporal mismatches and availability of nesting habitat availability for willow flycatcher.

Future changes in climate (i.e. increasing temperatures) combined with a change from a snow-dominated to a rain-dominated system will impact meadows due to changes in the hydrologic regime. Total meadow area may decline and wet meadows may shift to dry meadows, especially small irregularly shaped meadows at low to mid elevations (Gross and Copoletta 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Roads

Alteration of flow paths from roads can affect meadow and wetland function, with the effects extending far beyond the area road itself (Hunsaker et al. 2013). A local study in the Kings River Experimental Watershed found that only 13 percent of the road length in the study area allowed streams that they crossed to be ecologically-connected on either side of the road. The Sequoia National Forest is developing a prioritized list of sites where roads block stream connectivity, and are applying well developed principles for upgrading or decommissioning roads (Hunsaker et al. 2013).

Grazing

There are currently no occupied willow flycatcher sites, so none that overlap with livestock grazing on the forest. Efforts to improve riparian areas, primarily springs and relatively small portions of streams within annual grass systems are the result of positive mitigations resulting from ongoing allotment analyses on the forest. As a result of analyzing range condition through the NEPA process, eight allotments required riparian area fence protection totaling 24 specific riparian areas. All of the sites required fencing to reduce livestock impacts and move the area to an acceptable standard. Sixteen of the sites have been constructed

and the remaining seven are pending (NEPA completed in September 2011 for 8 sites, one of which was completed in 2012). Four additional riparian enclosures were constructed on Greenhorn Mountain to rectify resource concerns. All of the sites fenced thus far have shown improvement and upward trends in the riparian component of the sites.

Current livestock numbers on the Sequoia National Forest are approximately 60 percent of those permitted in the 1960s. Conditions in meadows and riparian areas have generally been improving and most measures of rangeland condition indicate an upward trend. Livestock grazing is likely to be sustained within the planning area over the next 20 years. The amount of livestock grazing may decline to some degree due to reduced forage capacity (declining condition of upland browse, lack of fire, and timber canopy closure) and tighter administrative constraints for protection and enhancement of threatened, endangered, sensitive species habitat and other resource concerns such as water quality.

Hydroelectric power/water diversions

It is unlikely that the Forest will see expansion of hydropower development on the rivers within the Forest since that potential has already been fully developed. Any increased energy production will be related to improved technology or expansion of existing facilities.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

A substantial decline has been reported for willow flycatchers in the Sierra Nevada over the past 40 years, resulting in the absence or near absence from many historically occupied areas. The last detection during formal monitoring of the one previously occupied site in the plan area was in 2001, of one individual and no occupation. There are multiple willow flycatcher reports in the eBird database for the plan area, but confirmation on these detections are unknown. Although overall habitat conditions that support the willow flycatcher on the Sequoia National Forest appear stable to improving, water use from expanding population demands, coupled with events related to climate change, including increasing temperatures, temporal changes in precipitation, and runoff events, will continue to put this species and its associated habitat components at risk in the future. *There is substantial concern about this species ability to persist on the planning unit.* Based upon the evidence and supporting best available science, willow flycatcher (*Empidonax traillii brewsteri and Empidonax traillii adastus*) meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Mammals

Fringed myotis - *Myotis thysanodes*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Reduction in available roost sites through the removal of conifer and hardwood snags, loss of roost sites through improper closure of abandoned mines or caves.

Rationale for fringed myotis

NatureServe Global Rank: G4

NatureServe T Rank: T2

State Rank: S3

Other Designations: CA-SGCN; FS-SS

The fringed myotis (*Myotis thysanodes*) has a global rank of G4 (Apparently Secure) and a California State rank of S3 (Vulnerable). The subspecies *Myotis thysanodes vespertinus*, which is believed to occur in Siskiyou, Shasta, Humboldt, and possibly Trinity Counties, has a subspecies rank of T2. The subspecies *Myotis thysanodes thysanodes* occupies the remainder of California does not have a subspecies rank. The fringed myotis bat is recognized as a species of greatest conservation need by CDFW. This species has been assigned a high priority designation by the Western Bat Working Group (2016), indicating this species should be considered one of the highest priority for funding, planning, and conservation actions as it is considered imperiled or are at high risk of imperilment. The fringed-myotis is also a Region 5 Forest Service Sensitive species.

Population size is unknown, however, they are thought to be widely distributed but rare everywhere they are found (CBWG 2016). While population trends are unknown, the limited data available suggests serious population declines (CBWG 2016). Many historically occupied sites are no longer occupied for a variety of reasons including human disturbance, modification of surrounding habitat, and exclusion from sites for health and safety reasons (CBWG 2016).

Fringed myotis are often found in oak woodland, pinyon juniper, mixed conifer forests, and mesic old growth forests in California (O'Farrell and Studier 1980, Weller and Zabel 2001). Fringed myotis roost colonially and are known to be highly sensitive to disturbance at roost sites (O'Farrrell and Studier 1973, O'Farrell and Studier 1980). They use a variety of roosting structures, but are most often associated with rock crevices, conifer snags, abandoned mines, caves and buildings (Baker 1962, O'Farrell and Studier 1980, Cryan 1997). In forests, they are reliant mainly on snag habitat for roosts. Snags documented to be used by fringed myotis for roosting in California are the tallest or second tallest pine or fir snag, have loose or sloughing bark, are > 58.5 cm dbh (23 inches), and are often in groups of 5 (Weller and Zabel

2001). They have also been documented to use giant sequoia basal hollows as maternity roosts in Yosemite's Merced Grove (Pierson et al. 2006). Fringed myotis forage along streams in fairly cluttered habitat as well as meadows.

Threats to the persistence of fringed myotis include reduction in availability or loss of roost sites. Removal or exclusion from anthropogenic roost sites such as buildings is most prevalent in urban areas and results from restoration of historic structures, human disturbance, or extermination/exclusion for human health and safety reasons. Loss of roost sites in urban environments is not considered a limiting factor within the plan area.

Removal or loss of large snags and damaged trees ≥ 58 cm dbh (23 inches) during timber harvest or prescribed or wildland fire may result in a reduction of roost site availability on National Forest System lands (CBWG 2016). Like most forest dwelling bat species, fringed-myotis are documented to mainly use snags as roosting structures in forested habitat (Weller and Zabel 2001). Retention and recruitment of adequate snags in number, size, configuration, and decay class throughout the plan area is considered a potential limiting factor based on the ephemeral nature of these structures and the potential for loss during harvest operations and prescribed and wildland fires.

Recreational mining and closure of abandoned mine sites may have resulted in displacement of bats and reduction in roost site availability (Belwood and Waugh 1991). Several of the mine closures in the plan area have been accomplished by installing bat friendly gates that are designed to allow entry by bats but not humans. White-nose syndrome (a cold-loving fungus that afflicts bats hibernating in caves and mines) is a potential threat that has not yet been detected in California, but has recently been documented in Washington State (Sleeman 2016). Fringed myotis are not known to be affected by white-nose syndrome; however, they are known to use mines (O'Farrell and Studier 1980) and populations may be negatively impacted if this disease becomes established in the plan area.

Forest-Specific Rationale

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012.

Information on current distribution of the species on the planning unit

The CNNDB has recorded occurrences of the fringed myotis on the southern part of Sequoia National Forest and at Case Mountain near Sequoia National Park (California Department of Fish and Game 2003). The entire Sequoia National Forest is within the mapped CWHR range for this species (J. Cordes pers. comm.). According to the CNNDB, fringed myotis have been recorded at Miracle and Democrat Hot Springs in Kern County. One male was collected in 1998 and a post-lactating adult was captured and released in 1992 (at a mine), both on the Kern River RD. One male was collected in 1999 south of Delonegha Hot Springs, along highway 178 and the Kern River (Kern River RD). There are no occurrence records of fringed myotis in the NRIS database, however, there have been very few bat surveys conducted on the forest in recent years.

Key ecological conditions for this species (see above for additional details).

Large trees and snags that are greater than 58 cm dbh (23 inches) and abandoned mines and caves provide critical roosting habitat and hibernacula.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

There are 36 active mining claims on the Sequoia National Forest; 35 are located on the Kern River Ranger District and 1 active mining claim on the Western Divide Ranger District (BLM claim records 2010).

The Sequoia National Forest and Giant Sequoia National Monument has 255 known abandoned mines which were surveyed from 1993-1998 (Bureau of Land Management Mining Claim Geographic Index Report 2009 as summarized in a spreadsheet by Donna Duncan Kern River Ranger District Sequoia National Forest/Giant Sequoia National Monument).

Large snags and trees can be found in the montane zone where varied mixtures of ponderosa pine or Jeffrey pine, sugar pine, incense cedar, and white fir dominate, with some red fir at higher elevations; the montane zone represents 46 percent of the assessment area.

Large tree density varies considerably by forest type. High elevation red fir, lodgepole pine and Jeffrey pine forests have relatively high mean or median densities. Trees greater than 30 inches in diameter are generally four trees per acre or more. The coefficient of variation (COV), a measure of how variable those numbers are is 122 percent. This means that the densities vary radically across the landscape. Although mean or median levels are moderate in these forest types, the coefficients of variation are often high. Mixed conifer forests have moderate but highly variable densities of trees greater than 30 inch diameter but trees greater than 40 inch diameter are sparse. These forests occur on more productive sites and trees greater than 40 inches in diameter were once more common. In ponderosa pine dominated forests, large trees (diameter greater than 30 inches) are less common and highly variable in occurrence, with mean and median densities of 2.8 and 2.0 trees per acre respectively. Hardwood-conifer and hardwood forests have relatively high densities of trees greater than 21 inch diameter (2 to 18 trees per acre) but the levels are highly variable. Densities of snags greater than 15 inches follow similar patterns by forest type but with levels at least 100 percent lower.

The projected status of those ecological conditions relative to the species considered

Fire

According to the recent fire resilience assessment, (Fites-Kaufman et. al. 2007), low and mid-elevation mixed conifer, pine, and foothill areas are mostly low to very low resilience under all weather conditions. Under hotter, drier and windier conditions all the mid and lower elevations have low to very low resilience to fire and would be prone to high severity fire and high levels of tree mortality. On the Kern Plateau, however, Jeffrey pine and eastside mixed conifer forests have variable fire resilience and tend to be drier and more open, with slower rates of fuel accumulation-overall fire resiliency is higher. This greater resiliency may reflect the lower fuel loading, lower moisture stress, and greater use of wildland fire for resource benefit in forest ecosystems on the Kern Plateau.

Recent research in the Southwest, which is similarly affected by overly dense forests at high risk of fire, has shown that at least some bat species will reoccupy charred/burned snags following fire (Saunders 2015). In that study, bats used snags with up to 100 percent bole burn. In the short term this could actually increase available roosting habitat, however, longer term effects may be less beneficial due to snags falling over time, and lack of recruitment of trees into larger size classes, resulting in a net loss in roosting habitat over time.

According to the National Report on Sustainable Forests (USFS 2004), there is a high possibility of increased high intensity fire (resulting from climate change) that could decrease old forest and increase

early seral habitat having cascading effects on patch diversity. Expected changes in climate and fire could lead to increased fragmentation of old forest and decreased fragmentation for early seral forest. With the exception of 2017, tree mortality has steadily increased the last several years, creating the potential for additional roosting habitat as a result of insect outbreaks and irruptions, but see related discussion above under fire for potential long term affects.

Insects and Pathogens

The Sequoia National Forest has been experiencing extreme drought and insect related (e.g. bark beetles, fir engravers) mortality and this is expected to continue. Mortality has been consistent across all major conifer with the most dramatic effects on fir species and ponderosa and Jeffrey pine. Statewide trends in 2017 showed that many areas experienced mortality at higher elevations (in the white and red fir) where it had was not been mapped previously, compared to previous years where most of the extensive mortality was observed in lower elevation pine and mixed conifer forests. See the Northern goshawk rationale for tables and maps regarding recent tree mortality.

Cliffs, caves and Cave-like Habitat

The amount of cliff, cave, and cave-like habitat is not expected to change; management activities would not substantially affect cliff, cave, or cave-like structures, although outside factors (below) could negatively affect their status. Mine closures if adequately gated can provide increased roosting habitat. Mining claims have the potential to increase in the future which could create additional adits and shafts for bat use, however this would be driven by the market/economy (see discussion below).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Bats have slow reproductive rates with usually one pup per year putting maternity roosts particularly at risk from disturbance and abandonment during summer months when young are not yet volant (typically June-July) and human activity may be higher.

Disturbance and Mines

Past mining activity has been mostly along the Upper and Lower Kern Canyon and in the Piute and Greenhorn Mountains. Some activity has occurred near Mountain Home State Forest and within the Hume Lake District during the 1930's and 1940's. Currently there are about five small mines in operation on public land within the Sequoia National Forest boundary. Current gold mining activity is confined mostly to weekend recreational prospecting such as gold panning. Mining activity is not expected to increase and mineral exploration is driven by market conditions. Abandoned mines may increase when market values decrease and operations cease. This could increase the potential for available bat habitat if habitat is properly gated.

Starting in 1995 the Sequoia National Forest/Giant Sequoia National Monument has had an active abandoned mine reclamation program and has taken reclamation actions on approximately four abandoned mines per year. Forest service records document approximately 18 bat gates and 2 bat nets with fencing installed from 1996-1999. (See Assessment chapter 10- Renewable and Nonrenewable Energy and Mineral Resources).

Timber

The Sequoia National Forest essentially abandoned even-aged reforestation management 20 years ago, in favor of stand maintenance thinning harvests intended to control density and growth of stands, generally

for habitat maintenance. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production, and increases growth rates on those remaining trees.

There are over 20,000 acres of plantations on the Sequoia National Forest in need of treatment that would allow the stands to develop old forest conditions. The treatments are needed to reduce fuel loading, reduce inter-tree competition, and improve the species mix within the stands. While these plantations contain some saw log size material, the majority of the trees are only suited for biomass. There are few projects that provide adequate volume to potential markets to make the projects commercially viable. This limits the forest's ability to keep up with the pace and scale necessary to realize restoration benefits.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

There are few detections of fringed myotis on the Sequoia National Forest. Range-wide population trends are unknown, but likely declining with many historically occupied sites no longer occupied. Forest habitat is at risk from stand replacing fire and bark beetle outbreaks. Because of fringed myotis' limited occurrence on the forest, and because an entire maternal colony could be concentrated in one snag or large tree, removal or loss of even one snag could have an adverse effect on the local breeding population. Caves and mines are numerous across the forest and potential bat habitat in the form of caves and mines is stable to increasing (via way of abandoned mines, if properly gated). Small mining operations and recreation may pose an additional risk factor from disturbance at maternity and/or roosting sites. For all these reasons, there is substantial concern about this species' ability to persist on the planning unit. Based upon the evidence and supporting best available science, fringed myotis meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Sierra marten - *Martes caurina sierrae*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to Sierra marten

Martens are extremely sensitive to the loss and fragmentation of mature forest habitat (Zielinski 2014). From a relatively continuous higher elevation distribution in the early 1900s, marten have retracted to isolated and discontinuous populations (Zielinski et al. 2005). Marten are impacted by loss of contiguous old forest breeding habitat from multiple sources, including timber harvest/thinning, vegetation management, extensive tree mortality resulting from drought-mediated insect and disease, and wildfire. Climate change also poses a serious threat due to the predicted increase in higher elevation fires. Lawler et al. (2012) predicted that as a result of changing climate, the range of marten in California will contract northward in latitude and upward in elevation, become less common, and functionally fragment. Recreational activities and roads (with associated roadkill) further increase habitat fragmentation. Additionally, the use of illegal rodenticide poisons to protect marijuana plantations is present throughout the marten's range in the Sierra Nevada (Gabriel et al. 2012). It should be noted that this marijuana growing activity is extensive, illegal, and neither authorized, funded, nor carried out by the Forest Service. Nonetheless, the impact to all predators is significant, and cumulatively presents an extremely detrimental effect to population health, survival and status.

Rationale for Sierra marten

NatureServe Global Rank: G4G5

NatureServe T Rank: T3

State Rank: S3

Other Designations: CA-SSC; CA-SGCN; FS-SS

Nationally, martens are ranked G4G5 (Apparently Secure/Secure) by NatureServe but S3 (Vulnerable) in California. The *sierrae* subspecies is NatureServe ranked as T3, indicating they are thought to be vulnerable and at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. Martens are listed as "*Species of Special Concern*" (SSC) by California Department of Fish and Wildlife and were designated a "*Species of Greatest Conservation Need*" (SGCN) in the California State Wildlife Action Plan (CDFW 2015). Sierra marten are Region 5 Forest Service Sensitive and MIS.

Martens use habitat at multiple spatial scales, including resting/denning, stand, home range and landscape (Zielinski 2014), and the areas used may differ by season (Martin and Barrett 1991, Spencer 1987). Sierra martens primarily occupy mature coniferous forests, typically more mesic than xeric (Buskirk and Powell 1994), supporting large-diameter trees and snags, multi-layered canopies (Fuller 2006), large downed logs, moderate-to-high canopy closure, structurally diverse and complex understory and interspersed riparian areas and meadows. These features provide resting and denning sites, as well as escape and thermal cover. In one Sierra Nevada study, martens specifically selected riparian forests for foraging (Spencer et al. 1983).

Coniferous forest types important to Sierra Nevada marten include red fir (*Abies magnifica*), lodgepole pine (*Pinus contorta*), subalpine conifer, mixed conifer-fir, Jeffrey pine (*Pinus jeffreyi*), and eastside pine. Marten are more prevalent in the upper montane zone of the Sierra, Stanislaus and Inyo national forests but will utilize lower montane forests as well as meadows (Zielinski et al. 1983).

The physical structure of the forest, including large live and dead trees, coarse woody debris, and a relatively low and closed canopy, appears more important for Sierra martens than species composition (Spencer et al. 1983, Hargis and McCullough 1984). Martens prefer forests with overhead cover and

complex ground structure to allow winter access to subnivean (below snow) spaces (Buskirk and Powell 1994). The arboreal habits of martens may have been exaggerated in early research (Buskirk 1994), when in fact, they find much of their food on the ground or under snow. A preference for physical structure or overhead cover is thought to arise from a need for protection from predators and, in areas of deep snow, access to subnivean areas provided by complex structures on the ground such as logs and rocks. Dens occur both in hollow trees (usually within cavities) and on or under the ground in logs or rock piles.

Martens demonstrate a high sensitivity to loss and fragmentation of mature forest habitat, seldom occupying an area after more than 30 percent of mature forest has been harvested (Bissonette et al. 1997, Potvin et al. 2000). Indeed, Moriarty et al. (2011) postulate that even the total amount of habitat may not be the most important determinant of marten occurrence. Rather, attributes of the landscape like core patch size, distance and spatial configuration of patches and microhabitat features within patches may be very important (Hargis et al. 1999). Vegetation management activities must therefore be cognizant of these elements, many of which occur in the understory.

Although talus fields are occasionally used, martens usually avoid open areas, and even small openings less than 50 meters (164 feet) across negatively affect use of an area by martens (Heinemeyer 2002). This behavior is attributed to predator avoidance. How marten use the habitat via movements, both seasonally and daily, appears to coincide with prey availability **(**Zielinski et al. 1983). Microtine rodents are particularly common dietary items, with birds, squirrels, and vegetation also reported (Martin 1994).

Marten appear to be very sensitive to removal of key resting and breeding habitat features from their home ranges. Moriarty et al. (2011) provide compelling evidence for a decline in the marten population on the Sagehen Experimental Forest (SEF) affected by the loss and fragmentation of habitat associated with decades-long timber harvest that consisted of clear-cut, shelterwood and salvage sales. This study documented a substantial decline in the number of martens detected. Key factors contributing to decline in marten numbers on the Sagehen site included decreases in habitat patch size, acres of core habitat area, total marten habitat and an increase in the distance between habitat patches (Moriarty et al. 2011). Loss and fragmentation of suitable habitat in the form of large live and dead/dying trees reduce availability of resting/denning sites (Moriarty et al. 2011). Reduced understory complexity may affect prey habitat and indirectly reduce the ability of marten to forage effectively (Moriarty et al. 2011, 2016); marten movement dynamics change as forest complexity declines, which results from alterations in foraging strategy and predator avoidance behavior.

Adult survival is the factor most critical for marten population sustainability (Buskirk et al. 2012), so the ability to avoid predation in structurally complex forests is a critical factor for marten. This has implications for energetic balances in these small carnivores (Taylor et al. 1970). Functional connectivity is mandatory for a species like marten to persist in fragmented landscapes (Moriarty et al. 2015). In fact, marten populations consistently decline or reach extirpation in areas below a threshold of 65-75% forest cover (Hargis et al. 1999, Moriarty et al. 2011).

Andruskiw et al. (2008) concluded that vegetation management actions reducing understory complexity have implications for marten prey as well as reducing the ability of martens to forage effectively. This effect was particularly notable in regenerating stands as opposed to older uncut stands. The same understory effects may also function to decrease marten escape cover, rendering them more visible to predators (Drew 1995). In general, martens avoid stands with simplified structure (Moriarty et al. 2016) and may use habitat differently in the summer as opposed to the winter (Zielinski et al. 2015).

The anticipated effects of climate change in the plan area include increased fires, especially an increase in higher elevation fires, which may result in a dramatic reduction in the forested habitat this species is

dependent upon. Martens are extremely sensitive to the loss and fragmentation of mature forest habitat (Zielinski 2014). Changes could include a loss of red fir (Lenihan et al. 2003) and lodgepole pine habitat (replacement by white fir or loss due to catastrophic wildfire) and increased competition from other carnivores (e.g., fisher) no longer constrained by snow levels. Also, because of the marten's declivity to cross large openings, large fires may fragment marten habitat and isolate populations leading to localized extinction. Habitat connectivity for an old forest-associated species like marten should contain a mosaic of vegetation types and structures that provide foraging and breeding habitat, and movement. Finally, increased drying conditions would lead to further desiccation of montane meadows. Drier meadows would likely reduce the prey populations upon which martens depend.

The southern extreme of the range for martens is within the plan area. Conventional ecology indicates that populations at the edges of their range 1) are more at risk than those in the center and 2) harbor more genetic diversity and thus the ability to adapt to changing environmental conditions. Lawler et al. (2012) predicted that as a result of changing climate, the range of marten in California will contract northward in latitude and upward in elevation, become less common, and functionally fragment. Climate change is predicted to alter fire regimes and facilitate fatal tree infections such as insect and disease. Predicted long-term trends toward warmer temperatures are likely to decrease snowfall and observations already suggest upper montane forests and associated species are migrating to higher elevations following the shifting snow line (Lawler et al. 2012). These same authors predict that a marten competitor, fisher (*Pekania pennanti*), may follow the warming climate upward and expand into current marten range.

Habitat quality for martens would likely be affected by both management actions and climate change. A vulnerability assessment by Hauptfeld et al. (2014) ranked overall vulnerability of the marten as moderate/high, due to its moderate/high sensitivity to climate and non-climate stressors, moderate adaptive capacity, and moderate/high exposure. Martens are also listed as "Climate Vulnerable" in the 2015 California State Wildlife Action Plan (CDFW 2015).

Recreational activities and roads that fragment contiguous habitat or compact snow also affect marten. The only study to examine the effects of OHV's (not used on snow) on martens in the Sierra Nevada found that martens appeared unaffected by OHV noise disturbance, remaining present in both the control and OHV use areas (Zielinski et al. 2008). Over snow vehicles have a potential impact to marten populations via several mechanisms. First, compacted snow from grooming and riding snowmobiles may facilitate access to marten habitat for predators and competitors that typically would not be able to traverse deep snows (Buskirk et al. 2000). There may also be snow compaction effects to the subnivean zone (Bunnell et al. 2006, Zielinski 2014). Martens and sables commonly appropriate the dens or subnivean refugia of prey species taken in winter, resulting in a much stronger dependence upon prey species (Zielinski 2015). Impacts to these below snow areas will affect both prey populations and marten resting habitat in the critical winter season.

A study on ski area effects was conducted in the Lake Tahoe Basin region of California and Nevada to assess marten population dynamics and habitat use (Slauson and Zielinski 2013). Ski resort development and operation creates habitat loss, fragmentation and potential behavioral disturbance. Snow compaction results from grooming (see OSV discussion). Marten movement was strongly affected by the width of individual ski runs, as well as by the cumulative width of runs that had to be crossed to move between habitat patches; females were less willing to cross the openings than males (Slauson and Zielinski 2013).

Habitat occupancy by martens was seasonally affected, with significant reductions within ski area operation boundaries during the winter (*Ibid*). There was not a reduction in occupancy during spring and summer, suggesting that the combination of habitat alteration and the winter activities themselves are the factors responsible for decreased winter habitat use (*Ibid*).

Areas within ski area operation permitted acreages may also be developed for spring/summer/fall use such as toboggan slides, mountain biking, zip lines and canopy rides. The effects of these have yet to be empirically examined, but potential for habitat quality degradation is evident if forested habitats are cleared to create a new footprint (D. Macfarlane, pers. comm.). Also, impacts in the form of construction or use are potentially greater if conducted during the marten kit-rearing season from March to August (Slauson and Zielinski 2013).

In contrast to the above, Kucera (2004) examined marten use of the Mammoth Mountain ski area near the Inyo National Forest in 2002-2003. This is an east-side, drier, less productive Sierra Nevada habitat. Kucera (2004) identified a seasonal use pattern, with marten ski area occupancy in the winter when prey is least available and anthropogenic food sources are readily available, followed by movement into unmanaged forest in the spring.

Roads affect martens directly via road kill of individuals as well as indirectly by providing a route for entry of marten predators and competitors into habitat they would otherwise be unable to negotiate (Slauson et al. 2010, Zielinski 2014), especially in winter. Predators include coyote, red fox, bobcat, and great horned owl (Bull and Heater 2001).

Another significant documented direct as well as cumulative impact is the use of illegal rodenticide poisons to protect marijuana plantations (Gabriel et al. 2012). It should be noted that this marijuana growing activity is extensive, illegal, and neither authorized, funded, nor carried out by the Forest Service. Nonetheless, the impact to all predators is significant, and cumulatively presents a detrimental effect to population health, survival and status.

In summary, key limiting factors affecting Sierra marten and their habitats are forest fuels reduction treatments, fire, insect and disease tree mortality, climate change and anticoagulant rodenticide poisoning. Recreational uses and development may also play a limiting role as marten are pushed upslope by climate change into smaller and more isolated patches of suitable habitat. Most of these factors are system drivers that serve to limit and fragment suitable Sierra marten habitat in California. These are clearly associated in scientific literature with declines in mature forest conditions.

The best available scientific information about Sierra marten habitat specificity, habitat loss/degradation and impacts of climate change indicates substantial concern about the species' capability to persist over the long-term in the plan area.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

In the CNNDB, there are 4 records for Sierra marten in Tulare and Kern County recorded over 20 years ago on the Kern River RD. There are 397 records for marten in the NRIS database (Figure 5). Most observations are of solitary individuals with one record of a family unit recorded in 1992. The most recent occurrence record in the NRIS database for Sierra marten was in 2010, no recent den sites are known. However, monitoring on the Sequoia is currently limited to presence/absence. Dens may likely exist because the species has persisted on the forest over time, but without more intensive telemetry work this has not been confirmed. Den site buffer management areas occur within the Giant Sequoia National Monument, which is outside the boundary of the forest plan revision analysis area (J. Cordes pers. comm).

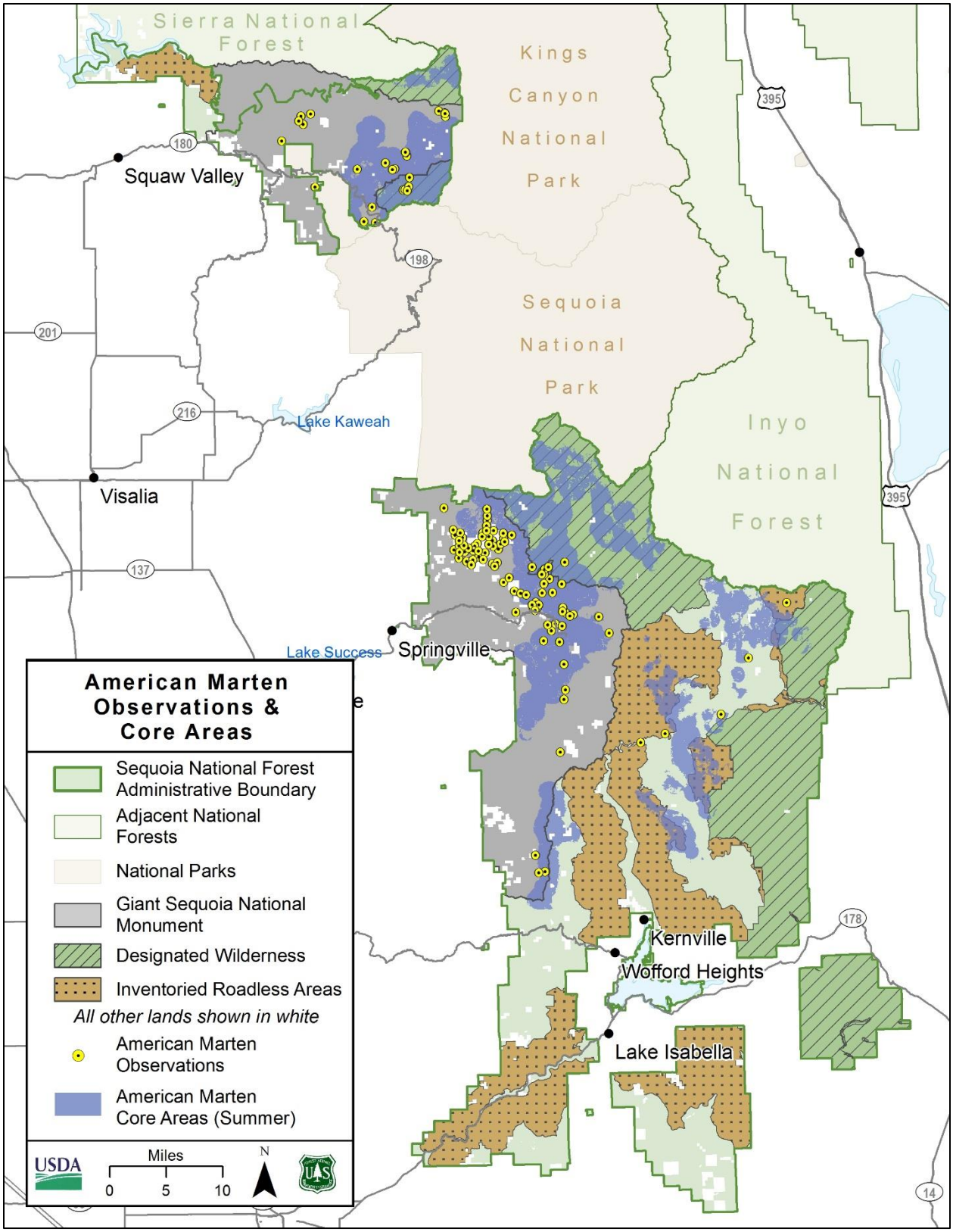

Figure 5. Sierra marten observations and core areas on the Sequoia National Forest and Giant Sequoia National Monument

Key ecological conditions for this species (See above for additional details)

Martens need structurally diverse mature conifer forests; abundant snags and down logs; heterogeneous habitat for cover and prey species, high canopy cover (40-60%). They are similar to fisher in that resting/denning structures are the most critical habitat elements. These ecological conditions occur at high elevation (4,500 to 10,500 feet) in late-successional, mature red fir and lodgepole pine forests in areas with abundant snow pack (greater than 9.2 inches in depth).

On the Sequoia National Forest, marten habitat can be found in the Montane, Upper Montane Zone, and Subalpine Zones which includes a mosaic of conifer forest, meadows, and montane chaparral. On the western slopes red fir, Jeffrey pine, and Lodgepole pine are the dominant forest species (Fites – Kaufman et al. 2007). Upper montane forest occurs above mixed conifer and occupies ¼ of the assessment area, snow is the primary form of precipitation. Forest types in the Subalpine and Alpine Zone covers less than 5 percent of the area and includes red fir and lodge pole pine and subalpine meadows which may provide refugia for some species as climate change related stressors push species to the edge of their range. Alpine environments on the Kern Plateau may be among the most threatened.

Upper montane forests occur above mixed conifer, occupying one-quarter of the assessment area, where snow is the primary form of precipitation. Red fir forests with Jeffrey pine on the rockier sites occur in the northern half of the forest. In the southern half of the forest, red fir is replaced by white fir. On more productive sites, western white pine is also found.

Potential habitat (excluding private land) available to marten on the Sequoia National Forest, is defined by the California Wildlife Habitat Relationships (CWHR) (Table 12). Approximately 278,775 acres of forest are classified as having dense cover (60-100 % closure) while 269,532 acres have moderated cover (40-59 %) that could support. There are approximately 124,744 acres of forest containing CWHR size classes > 24 inches (Sequoia assessment 2013-chapter 1 snapshot).

Table 12. Acres of potential habitat (excluding private land) available to marten on the Sequoia National Forest, as defined by the California Wildlife Habitat Relationships (CWHR)

CWHR Habitat Type	Acres
Montane Hardwood-Conifer	39211
Subalpine conifer	3331
Montane Riparian	5976
Ponderosa Pine	27556
Lodgepole pine	15,471
Sierran Mixed Conifer	229423
Jeffrey Pine	50112
Red Fir	105,801
White Fir	2853
Wet Meadow	4424
Total	484158

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Montane Zone

Composition, structure, and fire regimes have changed considerably since pre-settlement times (Van de Water and Safford 2011), and are largely outside the natural range of variability in the Greenhorn Mountains. Pines and oaks have decreased substantially and shade tolerant species, such as cedar and fir, have increased.

Compared to past conditions, forest density is greater, tree canopy is denser, and small and medium trees are more dominant in the forest. Within stand variation in tree size and density has decreased. Drought has triggered tree mortality in mixed conifers; and large tree mortality has doubled in the last 2-3 decades across the western United States. This pattern is associated with increases in temperature and droughts.

Large Trees and Snags

Large tree density varies considerably by forest type. High elevation red fir, lodgepole pine and Jeffrey pine forests have relatively high mean or median densities. Trees greater than 30 inches in diameter are generally four trees per acre or more. The coefficient of variation (COV), a measure of how variable those numbers are is 122 percent. This means that the densities vary radically across the landscape. Although mean or median levels are moderate in these forest types, the coefficients of variation are often high. Mixed conifer forests have moderate but highly variable densities of trees greater than 30 inch diameter but trees greater than 40 inch diameter are sparse. These forests occur on more productive sites and trees greater than 40 inches in diameter were once more common. In ponderosa pine dominated forests, large trees (diameter greater than 30 inches) are less common and highly variable in occurrence, with mean and median densities of 2.8 and 2.0 trees per acre respectively. Hardwood-conifer and hardwood forests have relatively high densities of trees greater than 21 inch diameter (2 to 18 trees per acre) but the levels are highly variable. Densities of snags greater than 15 inches follow similar patterns by forest type but with levels at least 100 percent lower.

Structural Heterogeneity

Variation in basal area was calculated on the Sequoia National Forest using Forest Inventory and Analysis (FIA) data. Almost all forest plots had had low within-stand variation. Large areas of high severity fire can reduce important forest structures such as large trees with cavities and mature mast-producing hardwoods. Like fisher, marten require areas with sufficient overstory and understory cover and uncharacteristically severe wildfire can reduce tree cover, fragment these areas and create barriers to animals traveling across heavily burned areas. These same key habitat elements can be affected by planned management activities.

The projected status of those ecological conditions relative to the species considered

Fire

According to the recent fire resilience assessment, (Fites-Kaufman et. al. 2007), low and mid-elevation mixed conifer, pine, and foothill areas are mostly low to very low resilience under all weather conditions. Under hotter, drier and windier conditions all the mid and lower elevations have low to very low resilience to fire and would be prone to high severity fire and high levels of tree mortality. On the Kern Plateau, however, Jeffrey pine and eastside mixed conifer forests have variable fire resilience and tend to be drier and more open, with slower rates of fuel accumulation-overall fire resiliency is higher. This greater resiliency may reflect the lower fuel loading, lower moisture stress, and greater use of wildland fire for resource benefit in forest ecosystems on the Kern Plateau.

According to the National Report on Sustainable Forests (USFS 2004), there is a high possibility of increased high intensity fire (resulting from climate change) that could decrease old forest and increase early seral habitat having cascading effects on patch diversity. Expected changes in climate and fire could lead to increased fragmentation of old forest and decreased fragmentation for early seral forest. With the exception of 2017, tree mortality has steadily increased the last several years.

While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sequoia National Forest substantial areas are at a low and very low fire resiliency index as described in Chapter 3 of the assessment, indicating they are susceptible to higher amounts of crown fire than expected.

Insects and Pathogens

The Sequoia National Forest has been experiencing extreme drought and insect related (e.g. bark beetles, fir engravers) mortality and this is expected to continue. Mortality has been consistent across all major conifer with the most dramatic effects on fir species and ponderosa and Jeffrey pine. Statewide trends in 2017 showed that many areas experienced mortality at higher elevations (in the white and red fir) where it had was not been mapped previously, compared to previous years where most of the extensive mortality was observed in lower elevation pine and mixed conifer forests. Summaries and maps of the drought and bark beetle outbreak related tree mortality is provided in the Northern goshawk rationale.

In summary, anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. In addition, projected increases (2006-2050) in mountain pine beetle activity for high-elevation white pine forest will have substantial cascading impacts on subalpine forest ecosystems, leading to outbreaks that can cause significant changes in forest structure, function, and composition (Meyer 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

Intensive monitoring of the habitat characteristics used by marten in Jeffery pine, lodgepole pine and red fir ecosystems on the Sequoia National Forest has not been documented. Talus fields and open meadow areas are also not assessed.

Key risk factors arising from non-ecosystem conditions and/or management activities

Connectivity

According to the DEIS (2016), much of marten core habitat overlaps with wilderness or inventoried roadless areas and would have limited management. Within the Sequoia National Forest 346,611 acres or 29% of the forest remain as inventoried roadless area. Of the initial inventoried roadless areas, 137,697 acres have been designated as Wilderness Overall, connectivity of old-forest associated species like marten is high, but vulnerable to uniform, high intensity fire during more severe weather conditions. Weather conditions conducive to intense fire are already increasing with climate change and are expected to increase more in the near and distant future.

The forest's north-south oriented canyons and mountains across most of the forest allows for northward movement. This will become increasingly important with climate change. At the higher elevations on either side, there is connectivity to areas to the north in wilderness or other specially designated areas such as the Giant Sequoia National Monument. The areas immediately to the north on Sequoia and Kings Canyon National Parks, the Sierra National Forest and the western portion of the Inyo National Forest are unique in the bio-region in having no road that crosses the crest. Wilderness areas on the east side of the Sequoia National Forest connect with this large block. Climate projections suggest that the Kern Plateau

may be at relatively lower climate exposure than other parts of the Sequoia National Forest (Schwartz et al. 2013a). West of the Kern River, there is north-south connectivity adjacent to the Giant Sequoia National Monument. This situation will change as vegetation becomes dense, fuels accumulate and climate warms, and fires increase in frequency and intensity. On the Sequoia National Forest, the California Connectivity Project overlaps with wilderness and inventoried roadless areas. The exception is on the south end of the forest, where a large swath between the foothills and higher elevation was designated as a safe area for moving between habitats. The California Connectivity project identifies the lands between the Breckenridge and Piute Mountains, mostly private, urbanized land, as a key connecting area between these two blocks managed by the Forest Service. However, this area is outside the range of Sierra marten.

Fire Suppression

Past suppression policies have led to conditions that can result in large areas of high severity fire that may be detrimental to old forest species such as marten. There is some uncertainty about the effects of fire severity on these species (Keane 2013 and Zielinski 2013).) Current science suggests strategically placed landscape treatments (SPLATS) can reduce fire severity and spread, and that combining these fuel treatments with prescribed and managed fire can effectively reduce the extent of high-intensity fires in the Sierra Nevada under most conditions (Gutiérrez et al. 2017).

Timber

The Sequoia National Forest essentially abandoned even-aged reforestation management 20 years ago, in favor of stand maintenance thinning harvests intended to control density and growth of stands, generally for habitat maintenance. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production, and increases growth rates on those remaining trees.

There are over 20,000 acres of plantations on the Sequoia National Forest in need of treatment that would allow the stands to develop old forest conditions. The treatments are needed to reduce fuel loading, reduce inter-tree competition, and improve the species mix within the stands. While these plantations contain some saw log size material, the majority of the trees are only suited for biomass. There are few projects that provide adequate volume to potential markets to make the projects commercially viable. This limits the forest's ability to keep up with the pace and scale necessary to realize restoration benefits.

Road related mortality

Sequoia National Forest's transportation system has developed and evolved over the past 100 years, with many roads and trails created by users during the 1900s. Since vegetation management has declined substantially since the early 1990s, public use of forest roads has grown steadily, and driving for pleasure is the single largest recreation use of Forest Service managed lands. The Sequoia National Forest currently manages and maintains a National Forest Transportation System which consists of approximately 1,646 miles of system roads. See above discussion on connectivity for additional information. Vehicle related mortality has been observed on the forest.

Recreation

Winter recreation use on the forest is relatively low, available recreation activities include downhill and cross-country skiing, snow play, riding snowmobiles and snow shoeing. There is one small ski resort, Alta Sierra, at the top of Greenhorn Summit. The Montecito Lake Resort on Generals Highway in the Hume Lake District maintains an area for cross-country skiing and snow play. Popular locations for snow play and cross country skiing are Big Meadows on the Hume Lake District, Quaking Meadow on the Western Divide District, and the Greenhorn Mountains and Kern Plateau on the Kern River District. Developed winter trailheads are maintained at Quail Flat and Big Meadow on the Hume Lake District. According to

NVUM data, most of the recreation on the forest happens in the summer. Most of the higher elevation areas become inaccessible due to snow and road closures during the winter months.

Rodenticide poisoning

Recent studies have documented a significant threat to species like fisher and marten from rodenticide poisons commonly used in illegal marijuana plantations (Gabriel 2012, 2015). A large proportion of fisher carcasses recovered between 2007 and 2011 in the southern Sierra research sites showed evidence of exposure to one or more rodenticides (Thompson et al. 2011). More than 300 illegal marijuana sites have been located in these research areas since 2002. Exposure is a likely threat, although there have been no confirmed poisonings on the Sequoia as of yet.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

There is no information on current marten population size or density estimates for the Sierra Nevada and there have been no documented denning sites with young on the Sequoia National Forest. Marten habitat has been fragmented, distribution reduced, and suitable habitat has also been reduced and isolated in parts of the range. The mixed conifer forests on the Sequoia National Forest are at high risk of loss from stand replacing wildfire and bark beetle related mortality. This primary risk, coupled with range wide declining and/or small population numbers of the marten, and reduced snow pack resulting from climate change, puts this species at future risk. Competition with fisher resulting from snowpack declines may be another potential threat. These changes may be of particular concern given the Sierra NFs location at the edge of the species southern-most range. For all these reasons, there is substantial concern about this species' ability to persist on the planning unit. Based upon the evidence and supporting best available science, Sierra marten meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Townsend's big-eared bat - *Corynorhinus townsendii*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Threats include human disturbance, improper mine/cave closure, white-nose syndrome, low fecundity or high first-year mortality.

Rationale for Townsend's big-eared bat

NatureServe Global Rank: G4

NatureServe T Rank: T3T4

State Rank: S2

Other Designations: CA-SSC; CA-SGCN; CA-ESA Candidate Threatened; FS-SS; BLM-SS

The Townsend's big-eared bat has a global rank of G4 (apparently secure) and California state rank of S2 (imperiled). There are five known subspecies and phylogenetic evaluation concluded that *Corynorhinus townsendii townsendii* is the only subspecies occurring in California (Piaggio and Perkins 2005, Piaggio et al. 2009). This evaluation considers the Townsend's big-eared bat at the species level and acknowledges that the subspecies present within the plan area is *Corynorhinus townsendii townsendii.*

The subspecies Townsend's Western big-eared bat (*Corynorhinus townsendii townsendii*) occurs throughout California and has a global rank of G3G4 (vulnerable to apparently secure) a subspecies rank of T3T4 (vulnerable to apparently secure) and California state rank of S2 (imperiled).The Townsend's big-eared bat is classified as a sensitive species by Region 5 of the Forest Service and the Bureau of Land Management; the California Department of Fish and Wildlife classifies it as Candidate Threatened, Species of special concern and species of greatest conservation need; and the Western Bat Working Group considers it a high priority species. This species is vulnerable due to high sensitivity to disturbance of roosting sites and strong affinity for specific cave habitat requirements.

Caves and cave-like roosting structures and hibernacula comprise its most critical habitat features; roost zones are in cooler air near the cave or mine entrance (Barbour and Davis 1969a, Kunz and Martin 1982). Historically, the Townsend's big-eared bat was found throughout California as a scarce, but widespread species (Barbour and Davis 1969a). Research suggests substantial declines throughout California over the past 40 to 60 years, including an estimated 54 percent decline in individuals, 52 percent decline in maternity colonies, and a 45 percent decline in available roosts (Pierson and Rainey 1998). The most marked declines occurred in the central Sierra Nevada (Pierson and Rainey 1998).

The species is highly vulnerable to human disturbance in or adjacent to caves, in particular hibernacula and nursery sites (Zeiner et al. 1990, Piaggio and Perkins 2005, Gruver and Keinath 2006). The species is particularly vulnerable during the maternity season, when females are aggregated and rearing defenseless young (Pierson and Rainey 1998); In fact, a single visit may result in abandonment of the entire roost (Barbour and Davis 1969a, Zeiner et al. 1990). Townsend's big-eared bats have low fecundity and high first-year mortality; therefore, populations are slow to recover (Pierson et al. 1999). Improper closure of caves or mines can eliminate access to roosting habitat and potentially trap bats if timing is not appropriate (Pierson and Rainey 1998, Gruver and Keinath 2006).

In addition to the existing, known threats, an emerging threat is white-nose syndrome. White-nose syndrome is a highly-contagious infection of hibernating bats and it has been associated with massive mortality of cave-hibernating bat species in the northeastern United States (Blehart et al. 2009). This disease has rapidly spread throughout the eastern United States and Canada since its discovery in 2006 and was recently discovered in Washington State in March of 2016 (Lorch et al. 2016). Townsend's big-eared bats (*Corynorhinus townsendii townsendii*) are not known to be affected by white-nose syndrome. *Pseudogymnoascus destructans,* the fungus that causes the disease known as white-nose syndrome, has been detected on a close relative, the Virginia big-eared bat (*Corynorhinus townsendii virginianus*) but they have not been documented to have the disease (Coleman 2014). Additionally, another close relative in the affected area, Ozark big-eared bat (*Corynorhinus townsendii ingens*) has not yet been confirmed to have white-nose syndrome or the fungus (Coleman 2014). Although unknown at this time, white-nose syndrome could have significant negative impacts to Townsend's big-eared bats if it becomes established in the plan area.

Forest-Specific Rationale

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012 and is included here for reference only.

Information on current distribution of the species on the planning unit

There are 14 records for Townsend's big-eared bat in the CNNDB database in Fresno and Kern Counties (Hume and Kern River RDs), including along the Kings River. Most of these past inventories recorded small colonies with less than 5 individuals present with most recent occurrence data form 1993. This species was detected as recently as 2010 in Giant Sequoia National Monument (J. Cordes Sequoia National Forest, which is not part of the forest plan revision area. There is a record at Windy Cliffs and at Boyden Cave south of Wren Peak that describes a bat roost near a gated entrance of a tourist cave, with a colony size of 25 females in 1987-1991 and noted it as a declining population. This cave is now gated to prevent disturbance.

Additional records were collected along the southwest shore of Lake Isabella in the vicinity of Miracle Hot Springs and associated mines along highway 178 and the Kern River, which would include the plan area. The most recent observations in CNNDB were collected in 1993. There are no records for

Townend's big-eared bat in the NRIS database, however, surveys for bats on the Sequoia National Forest have been limited. In summary, Townsend's bat use appears to be limited to foraging and day roosts and there are no known maternity colonies.

Key ecological conditions for this species (See above for additional details)

This species uses multiple ecosystem types for foraging and uses habitat which contains rocks (canyons, caves, mines, ledges, talus slopes, and cliffs), and or manmade habitat (buildings, bridges) as well as large trees and snags for roosting. The primary limiting factor for this species is adequate roosting habitat especially in caves and mines. Townsend's bats are among the most dependent of all North American bats on abandoned or inactive mines.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

There are 36 active mining claims on the Sequoia National Forest. There are 35 active mining claims on the Kern River Ranger District and 1 active mining claim on the Western Divide Ranger District (BLM claim records 2010). The Sequoia National Forest and Giant Sequoia National Monument have 255 known abandoned mines which were surveyed from 1993-1998 (Bureau of Land Management Mining Claim Geographic Index Report 2009 as summarized in a spreadsheet by Donna Duncan Kern River Ranger District Sequoia National Forest/Giant Sequoia National Monument). There are 15 well known caves and possibly as many as 100 caves located on the Sequoia National Forest. There are three well known caves (Greenhorn, Packsaddle, and Deep Creek) in the plan area. There were no significant caves identified in the assessment for the Sequoia National Forest.

The projected status of those ecological conditions relative to the species considered

The amount of cliff, cave, and cave-like habitat is not expected to change; management activities would not substantially affect cliff, cave, or cave-like structures, although outside factors (below) could negatively affect their status. Mine closures if adequately gated can provide increased roosting habitat. Mining claims have the potential to increase in the future which could create additional adits and shafts for bat use.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Bats have slow reproductive rates with usually one pup per year putting maternity roosts particularly at risk from disturbance and abandonment during summer months when young are not yet volant (typically June-July) and human activity may be higher.

Past mining activity has been mostly along the Upper and Lower Kern Canyon and in the Piute and Greenhorn Mountains. Some activity has occurred near Mountain Home State Forest and within the Hume Lake District during the 1930's and 1940's. Currently there are about five small mines in operation on public land within the Sequoia National Forest boundary. Current gold mining activity is confined mostly to weekend recreational prospecting such as gold panning. Mining activity is not expected to increase and mineral exploration is driven by market conditions. Abandoned mines may increase when market values decrease and operations cease. This could increase the potential for available bat habitat if habitat is gated as necessary.

Starting in 1995 the Sequoia National Forest/Giant Sequoia National Monument has had an active Abandoned Mine Reclamation Program and has taken reclamation actions on approximately four abandoned mines per year. Forest service records document approximately 18 bat gates and 2 bat nets with fencing installed from 1996-1999. (See Assessment chapter 10- Renewable and Nonrenewable Energy and Mineral Resources).

Due to the cave roosting nature of Townsend's big ear bat, white-nose syndrome is a potential future threat. However, with the exception of one case in Washington State, there are no documented cases of this disease in the west (Bat Conservation International 2017). In addition, bat species which have been hardest hit by WNS are characterized by colonies with large clustering behavior and caves with higher humidity levels (Marroquin et al. 2017). Townsend's bat tend to roost alone or in small clusters which may put it less at risk from the potential threat of WNS, should it makes its way to California.

The Forest has no transmission corridors, and there are no existing or planned transmission corridors, as identified in the West-Wide Energy Corridor Final Programmatic Environmental Impact Statement Nov 28 2008 and Record of Decision Jan 14 2009. It is highly unlikely that transmission corridors would be developed in the future. The continuous wilderness, wild and scenic rivers, roadless areas, and proposed wilderness that runs north–south through most of the east side of the Forest makes it highly unlikely that a transmission corridor would come through the Forests running east or west, and any proposed transmission corridors running north or south would most likely be located in flatter terrain through the San Joaquin Valley (USDA 1988). The need for additional energy from environmentally sensitive sources will likely increase requests for solar energy and wind energy locations on the Forest.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Townsend's big-eared bat has a ranking of G4 (apparently secure) in NatureServe and a California state rank of S2 (imperiled). The primary roosting habitat (i.e., caves and mines) this species uses is at or above reference conditions in the plan area. There are known summer roosts and no known maternity colonies in the plan area, however suitable habitat does exist. The Sequoia National Forest is actively installing bat friendly gates which provide protection for known hibernacula for all bat species. This effort may also increase potential roosting habitat by way of retired and or new mining adits. Although formal surveys for bats have not been conducted recently in the plan area, bats have been recently detected in the Giant Sequoia National Monument area. *There is sufficient information to demonstrate substantial concern for long-term persistence in the plan area.* Based upon the evidence and supporting best available science, Townend's big eared bat does meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Amphibians

Foothill yellow-legged frog - *Rana boylii*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Altered flow regimes in streams and rivers for hydroelectric power, water storage and water delivery; degradation of riparian habitat; disease; invasive species; pesticides; drought and climate change.

Rationale for Species

NatureServe Global Rank: G3

NatureServe T Rank: None

State Rank: S3

Other Designations: CA-SSC; CA-SGCN; BLM-SS; FS-SS

The foothill yellow-legged frog is currently under review for listing on the federal Endangered Species List (USFWS 2015) and the state Endangered Species List and is considered a Priority 1 Species of Special Concern by the California Department of Fish and Wildlife (Thomson et al. 2016). It is also ranked as Vulnerable (G3) by NatureServe Global, Vulnerable (S3) By NatureServe State, and Near Threatened by the IUCN. Given population declines throughout the Plan Area (Kupferberg et al. 2012, Thomson et al. 2016), and continued risks to existing stream habitats and populations, substantial concern for long-term persistence of the foothill yellow-legged frog exists in the plan area.

Foothill yellow-legged frog is known from the Coast Ranges, from northern Oregon through California and into Baja California, Mexico, and also from the foothills of Sierra Nevada and southern Cascade Range in California. The species has been known to occur on most national forests in Region 5. Since about 1970, foothill yellow-legged frogs (*Rana boylii*) have disappeared from significant areas in California and Oregon, including parts of the Sierra Nevada (Hayes et al. 2016).

Alterations to the natural flow regime in rivers and streams within the plan area can have direct mortality effects and indirect negative effects on foothill yellow-legged frogs by altering habitat availability and quality. Pulsed flows from dam releases can lead to scouring or stranding of egg masses and tadpoles resulting in reduced occurrence and population sizes in regulated river systems compared to unregulated rivers (Kupferberg et al. 2012). Even when flow regimes are managed for salmonids, there can be negative consequences for the frogs because late-season cold water releases cause delays in metamorphosis, which reduce overwinter survival of newly metamorphosed frogs (Railsback et al. 2016). Regulated reaches are also more likely to support invasive species that compete with or predate on *R. boylii* (e.g., Fuller et al. 2011). Furey et al. (2014) found that Didymosphenia, an invading species of stalked diatom that is unpalatable to aquatic grazers such as larval *R. boylii*, can carpet benthic environments in regulated reaches of the American and Feather River systems causing food shortages for tadpoles. Illegal marijuana production in California is centered in sensitive watersheds with high biodiversity (Bauer et al. 2015), and has been observed in the Southern Sierra Nevada.

In headwater streams above major dam sites in the plan area, additional stressors such as human disturbances, drought, and disease can affect population persistence. The proliferation of trespass cannabis grow sites can damage aquatic habitat quality by diverting water and adding detrimental toxicants to headwater streams (M. Gabriel and A. Cummings, pers. comm.). Kerby and Sih (2015) found that a non-lethal concentration of the pesticide carbaryl interacts with other stressors, such as the presence of non-native crayfish, to reduce survival of foothill yellow-legged frog tadpoles by 50 percent. Drought can impact foothill yellow-legged frogs by causing drying of normally perennial streams resulting in the stranding of tadpoles and recently metamorphosed frogs. The deadly amphibian disease chytridiomycosis, caused by the fungal pathogen *Batrachochytrium dendrobatidis* (Bd), has recently been implicated in a die-off of *R. boylii* in a San Francisco Bay area watershed (Adams et al. 2017), and Bd has been found to be prevalent in *R. boylii* populations in southern CA (Adams pers. com.) and northern CA (Pope et al. 2016).

The current distribution of *R. boylii* is strongly correlated with climate variables, which suggests that this species will be sensitive to climate changes that affect stream hydrology (Thomson et al. 2016). In the Sierra Nevada, snowpack losses of 50-90% are predicted by the turn of the twenty-first century resulting in earlier runoff and reduced spring and summer stream flows (Dettinger et al. 2004, Maurer et al. 2007). How frogs will respond to these changes is unknown, but reduced water availability in the Sierra Nevada will likely lead to more conflict with human use of water and affect how regulated reaches are managed, likely to the detriment of this species (Thomson et al. 2016).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Although the species was found to be absent from many historic locations on the forest during surveys occurring from 1990 through 2000, positive detections were made after 2000 (see review in Hayes et al. 2016). The two most recently occupied localities on the Sequoia National Forest consist of unnamed tributaries of the North Fork Kern River, given the names Ash and Jywood Creeks (Hayes et al. 2016). However, foothill yellow-legged frogs may have been extirpated from Ash Creek (Lind et al. 2003). In Jywood Creek, at least two adult foothill yellow-legged frogs were observed during every survey between 1998 and September 2002 (Lind et al. 2003). The known foothill yellow-legged frogs on the Sequoia National Forest appear to be very few and limited in distribution, and may be near extirpation in the region.

Key ecological conditions for this species

This is a stream-breeding frog, often associated with larger streams with coarse substrates. However, they also have been found in smaller tributaries, and in areas with finer substrates or bedrock (Moyer 2007). Key ecological conditions for the foothill yellow-legged frog are water quality and quantity. This species is found in partially shaded rocky streams in a variety of habitats, including blue oak woodland, chaparral/live oak, black oak/ponderosa pine, montane and wet meadows and appear to be highly dependent on free water for all life stages (Morey 2007).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Stream morphology and temperatures may be affected by hydroelectric use on the Sequoia National Forest. Dam and diversions also contribute to aquatic habitat alteration by blocking fish movement or migration, and contribute to species isolation. Major dams and their reservoirs are found just off the forest on the Kings, Tule and Kern Rivers and block the movement of warm water native fishes. Smaller dams and diversions that are run off of the facilities on the Kern and Tule Rivers block the movement of warm and cold water species, and have encouraged conditions for bass or brown trout, both non-natives (USDA 2013).

Fish stocking in rivers, streams, reservoirs, and previously fishless lakes have reduced native fish and amphibians, for example yellow-legged frogs. Other aquatic invasive species, such as quagga mussel and New Zealand mudsnails, have spread throughout California on boats, fishing equipment, and other water sports gear (Moyle et al. 2015). On the Sequoia, many species of warm water non-native fishes have been introduced into lower elevations on the Kern, Tule and Kings Rivers associated with reservoirs. Non-native and hatchery trout were introduced into formerly fishless streams on the Tule, White and Deer watersheds and above natural barriers on the Kings and Kern Rivers. These trout were also introduced into areas where native trout were home to and caused the elimination of the native trout from much of their natural range. These non-native fish outcompete and feed on the native species in these lakes, including insects, frogs, and fish.

Non-native bullfrog has become widely dispersed across the forest at elevations less than 5,500 feet. The New Zealand mud snail has caused significant disruptions in stream food chains across many trout streams of the western United States. This invasive has not been identified on the forest yet.

The projected status of those ecological conditions relative to the species considered

Water quantity and quality, including stream morphology and temperatures, may be affected in the future as hydroelectric use continues and increases. In turn, the non-native aquatic species are also projected to persist as conditions allow for them.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

There are multiple threats to foothill yellow-legged frog. Changes in stream temperature or morphology can cause high mortality during the egg and larval life stages. The main causes of mortality in eggs are hydrologic in nature. Eggs are usually killed by either desiccation or scour (Kupferberg et al. 2012). Loss of genetic diversity due to habitat loss is a major threat to foothill yellow-legged frogs. Populations which are more than 10 kilometers apart are prone to genetic drift and barriers such as dams or habitat fragmentation may prevent dispersal between isolated populations (Dever 2007). Pesticides can impact these frogs in both original and derived forms. Chloroxon (the oxon derivative of chlorpyrifos) killed all tadpoles exposed to it in Sparling and Fellers (2007) study and was at least 100 times more lethal than the parent chemical. Air-borne pesticides are implicated as the most significant threat to this species, especially for Sierra Nevada populations which are directly impacted by pesticide drift from the central valley (Fellers 2005).

Non-native fish have been introduced or have invaded most waters of the range. These waters include extensive areas that were once fishless at high elevations. Sierra Nevada fisheries have largely shifted from native fishes, especially salmon and other migratory fishes, to introduced fishes (USDA 2013). Predation by non-native, introduced fish is a major threat to this species. Smallmouth bass (*Micropterus dolomieu*) readily consume both larvae and adult frogs and are capable of directly affecting populations of foothill yellow-legged frogs. Additionally, predation or competition with introduced American bullfrogs (*Rana catesbiana*) likely impact this species (Fellers 2005). Native garter snakes (*Thamnophis* spp.) feed heavily on all life stages of this frog (Morey 2007).

Parasites pose an additional threat to foothill yellow-legged frogs. The parasite *Ribeiroia* has been shown to cause severe limb deformities in other frog species and has been found in the vicinity of foothill yellow-legged frogs. Another parasite, anchor worm (*Lernaea cyprinacea*), is non-native and typically infects fish but can infect larval foothill yellow-legged frogs which can cause deformities or mortality. In addition, the most significant parasite that impacts this species is *Batrachochytrium dendrobatidis* which causes amphibian chytridiomycosis. This parasite has been found in this species and has had significant impacts to the similar mountain yellow-legged frog (*Rana sierra* and *Rana muscosa*) and other amphibian species worldwide (Fellers 2005).

Dams and other diversions also contribute to aquatic habitat alteration by blocking aquatic species movements or migration, and contribute to species isolation. Major dams and associated reservoirs are located nearby, off forest, on the Kings, Tule and Kern Rivers, which block the movement of warm water native fish. Smaller dams and diversions that are run off of the facilities on the Kern and Tule Rivers block the movement of warm and cold water species, and have encouraged conditions for bass or brown trout, both non-natives.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The biggest threats to this species on the Sequoia National Forest are the loss of water quality and quantity due to hydroelectric use. These factors combined with the loss of genetic diversity due to habitat loss, pesticide use, non-native fish and aquatic species competition for habitat, and direct mortality due to predation or disease, puts the foothill yellow-legged frog at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the foothill yellow-legged frog meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Fairview slender salamander - *Batrachoseps bramei*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Ground disturbance to microsite conditions, degradation or loss of habitat due to ground disturbance, fire suppression equipment and road maintenance.

Rationale for Species

NatureServe Global Rank: G3

NatureServe T Rank: None

State Rank: S3

Other Designations: FS-SS

Members of the genus *Batrachoseps* are known as the slender salamanders or "worm salamanders" and are a lungless terrestrial salamander of the family Plethodontidae (Nussbaum et al. 1983). They are found only along the Pacific coast of North America, where 19 species have been described in California, Oregon, and Baja California, Mexico (Olson 2008). Genetic studies have discovered that the genus *Batrachoseps* is the most diverse group of salamanders in western North America (Jockusch and Wake 2002, Jockusch et al. 2012). Until the work of Brame and Murray (1968), Sierra Nevada populations of attenuate *Batrachoseps* were included within California slender salamanders (*B. attenuatus*), a wide-ranging composite species. Yanev restricted the name *B. attenuatus* in the Sierra Nevada to the northern and central portion of that range, allocating Sierran populations of B. attenuatus from Mariposa County southward to black-bellied slender salamanders (*B. nigriventris*). Jockusch et al. (1998) demonstrated that Sierra Nevada *B. nigriventris* were specifically distinct from southern California and coastal populations of that species and described gregarious slender salamanders to accommodate the Sierran portion of the range. Wake and Jockusch (2000) include *B. gregarius* in a *B. nigriventris* complex, consisting of *B. nigriventris*, *B. gregarius*, *B. simatus*, and *B. stebbinsi*, as well as undescribed taxa from the southern Sierra Nevada (Hansen and Wake 2005).

In general, slender salamanders do not need standing or flowing water for breeding or any other part of the life cycle (Stebbins 2003). During wet season conditions, slender salamanders can be near the surface and as conditions dry out, this species will retreat to microsite areas where moisture can be found. Microhabitat may include surface cover such as down wood (in or under logs, under bark or boards), rocks, and litter.

Batrachoseps salamanders tend to have very small home ranges. Studies on a similar localized California slender salamander (*B. attenuatus*) found that adult salamanders moved an average of approximately 5 feet over a two year period and were found to repeatedly use the same cover object (Kucera 1997). In general *Batrachoseps* salamanders demonstrate high site fidelity and rarely move more than 5-10 meters over their lifetime (Cunningham 1960).

For terrestrial salamander species, ground disturbance from a variety of sources could directly impact individuals on the surface cover substrate, such as rocks, logs or forest vegetation litter. They can also be negatively affected by fire, but their habitat may be maintained or improved with the restoration of periodic low severity fire. As these species tend to be fairly localized, trends can only be evaluated in the context of known populations and the suitable habitats within their known or potential range (USDA 2013).

The Fairview slender salamander is endemic to California and is found only in the Upper Kern River Canyon along the west side of Lake Isabella, on the east and west sides of the river, from Wofford Heights north to 1 kilometer north of where South Falls Creek flows into the Kern River (Jockusch et al. 2012).

This species may be found farther north but surveys are lacking. In addition, it should be noted that this species is not found in sympatry with any other slender salamander species. The nearest *B. simatus* locality is 13 km south. *B. robustus* has been found 7 km east, but at a much higher elevation.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

There are 13 sites documented for the Sequoia National Forest in CNNDB. All sites are located in the plan area, occurring on the eastern side of the Greenhorn Mountains, from just south of Sherman Peak to Isabella Lake along the Kern Canyon corridor. There are no records in the NRIS database for the Fairview slender salamander on the Sequoia National Forest.

Key ecological conditions for this species

Key ecological conditions for the Fairview slender salamander include oak woodlands, chaparral habitat, riparian corridors, forest litter, rocks, down logs and woody debris. This species is also known to inhabit drier habitats than most slender salamanders, such as talus slopes and uplifted ridges of metamorphic rocks paralleling the Kern River (Jockusch 2002, 2012). This species is active in moist fall, winter and spring months.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Terrestrial ecosystems are diverse on the Sequoia National Forest. The forest can be roughly divided into three distinct ecological environments: the Greenhorn Mountains, the Kern Plateau, and the Breckenridge, Piute, and Scodie Mountains. The integrity of ecosystems or ecological zones have been especially impacted by historic management such as surface mining, road locations, timber harvest and intensive grazing during the 1800s and early 1900s. Fire suppression has impacted riparian habitat by increasing conifer density and decreasing riparian hardwood and herbaceous vegetation. Fire suppression associated with past vegetation management has also led to increased forest density and fuel loads across the forest. Consequently, fires are more intense and uniformly severe, and forests are more vulnerable to insect and pathogen outbreaks and drought-related tree mortality (USDA 2013).

The projected status of those ecological conditions relative to the species considered

The natural potential for fire on the landscape is high. *B. bramei* inhabits plant communities which experience periodic fires. Suppression of these fires using heavy equipment could degrade *B. bramei* habitat. Additionally, the close proximity of some populations to Mountain Highway 99 means that roadwork has the potential to affect their habitat (Cavagnaro 2012). As fire frequencies increase, degradation and loss of habitat for this species will also increase. More climate change effects are expected. W and warmer temperatures, longer drought, along with more rain than snow are occurring. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. Warmer temperatures and drought will dry the ground and wood and other cover for salamanders. This will restrict their movements further. Invasive plant species are also expected to increase, especially in the surrounding foothills. Once an invasive species dominates a site, fire patterns are expected to change and become more frequent. Land management activities that degrade or remove ground cover or forest litter can also further impact this species.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

For the more terrestrial salamander species, ground-based disturbance from a variety of sources could directly impact individuals on the surface or under rocks, logs or forest litter. This species is most threatened by degradation or loss of habitat. Ground disturbance that alters or removes ground cover, including woody debris and forest litter can directly impact this species.

Additional threats to this species include disease and natural predators. *Batrachochytrium dendrobatidis* has been documented for the California slender salamander (*Batrachoseps attenuatus*), however, the actual impacts of chytridiomycosis on this species is unknown. Natural predators of this species likely include: spotted and striped skunks, ringtails, raccoons, gray foxes, ring-necked snakes, and various skinks, moles and shrews (Krueger 2016).

This species is also vulnerable to stochastic events such as fire or climate change. Large scale fire can directly eliminate individuals and localized populations if the severity is high enough to remove forest litter and woody debris. Warmer temperatures and drier conditions will dry the ground, wood, litter, and other cover for salamanders; restricting the time that they are active each year.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The Fairview slender salamander is restricted to a small area along the Kern River corridor on the Sequoia National Forest plan area. The biggest threats to this species on the Sequoia National Forest are degradation or loss of habitat from ground disturbing activities, such as bull dozers during fire suppression and heavy machinery during salvage operations, temporary road construction, surface mining and skid trails associated with timber harvest. These factors combined with increased stochastic fire events of high intensity, drought and other effects of climate change, put the Fairview slender salamander at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the Fairview slender salamander meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Kern Canyon slender salamander - *Batrachoseps simatus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Ground disturbance to microsite conditions, degradation or loss of habitat due to ground disturbance, fire suppression equipment and road maintenance and road realignment.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: S2S3

Other Designations: CA Threatened; FS-SS; CA-SGCN

See the description of members of the genus *Batrachoseps*, known as the slender salamanders or "worm salamanders" in the Fairview slender salamander rationale.

Kern Canyon slender salamander was pettitoned for listing in 2015. 80 FR 37568 37579 USFWS had a postive 90 day finding on the speceis. It is currently under review. The Kern Canyon slender salamander is endemic to the Southern Sierra and is found south of Lake Isabella, along the Kern River and its tributaries (Jockusch et al. 2012).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

This species is endemic to the Sequoia National Forest. There are 11 sites documented for the Sequoia National Forest in CNNDB. All sites occur on the eastern side of the Greenhorn Mountains, from just south of Isabella Lake, along the Kern River corridor (Jockusch 2002, 2012, USDA 2013). There are no records in the NRIS database for the Kern Canyon slender salamander on the Sequoia National Forest.

Key ecological conditions for this species

Key ecological conditions for the Kern Canyon slender salamander include, north-facing riparian zones in narrow canyons shaded with willows and cottonwoods, wooded hillsides supporting oaks and pines, including wet creek margins, seeps, talus, and exposed chaparral (Jockusch 2002, 2012, USDA 2013).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

B. simatus is restricted to an area south of Lake Isabella, along the Kern River and its tributaries on the Sequoia National Forest. The integrity of ecosystems or ecological zones on the forest have been especially impacted by nested communities, unregulated user created routes and other activities on Forest Service lands, surface mining, road construction, timber harvest, and intensive grazing during the 1800s and early 1900s. Fire suppression has impacted riparian habitat by increasing conifer density and decreasing riparian hardwood and herbaceous vegetation. Tree mortality associated with the drought and insect outbreaks has altered the ecosystem in this area.

The projected status of those ecological conditions relative to the species considered

Surface mining, and timber harvest have decreased substantially over the past 20 years, and as a result, ground disturbance from these activities as also decreased. The potential for fire on the landscape is high. As fire severity and intervals increase, degradation and loss of habitat for this species will also increase. More climate change is expected and warmer temperatures, along with more rain than snow are occurring. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. Invasive plant species are also expected to increase, especially in the surrounding foothills. Once an invasive species dominates a site, fire patterns are expected to change and become more

frequent. Land management activities that degrade or remove ground cover or forest litter can also further impact this species.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

For the more terrestrial salamander species, ground-based disturbance from a variety of sources could directly impact individuals on the surface or under rocks, logs or forest litter. This species is most threatened by degradation or loss of habitat. Ground disturbance that alters or removes ground cover, including woody debris and forest litter can directly impact this species.

Additional threats to this species include disease and natural predators. *Batrachochytrium dendrobatidis* has been documented for the California slender salamander (*Batrachoseps attenuatus*), however, the actual impacts of chytridiomycosis on this species is unknown. Natural predators of this species likely include: spotted and striped skunks, ringtails, raccoons, gray foxes, ring-necked snakes, and various skinks, moles and shrews (Krueger 2016).

This species is also vulnerable to stochastic events such as fire or climate change. Large scale fire can directly eliminate individuals and localized populations if the severity is high enough to remove forest litter and woody debris.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The Kern Canyon slender salamander is restricted to a small area along the Kern River corridor, south of Lake Isabella, on the Sequoia National Forest. The biggest threats to this species on the Sequoia National Forest are degradation or loss of habitat from ground disturbing activities, such as road construction, surface mining and timber harvest. These factors combined with direct mortality due to predation, disease and increased stochastic fire events of high intensity, along with climate change, put the Kern Canyon slender salamander at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the Kern Canyon slender salamander meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Kern Plateau salamander - *Batrachoseps robustus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Endemic species, very restricted range size, found on the Kern Plateau. Threats include unauthorized OHV travel, climate changes such as longer drought and flash floods, road construction, timber harvesting, and water diversions.

Rationale for Kern Plateau salamander

Rationale for Species

NatureServe Global Rank: G3

State Rank: S3

Other Designations: None

NatureServe ranks the Kern Plateau salamander as vulnerable to extinction at both the global (G3) and state (S3) levels. It is considered near threatened per the IUCN Red List on the basis of small (<5,000 km^2) extent of occurrence. Kern Plateau slender salamander was pettitoned for listing in 2015. 80 FR 37568 37579 USFWS had a postive 90 day finding on the species. It is currently under review.

The Kern Plateau salamander has been detected at 36 sites, including the Kern Plateau and isolated populations around Sherman Peak, Owens Valley and the Scodie Mountains in California (Wake, et al. 2002). *Batrachoseps robustu*s were abundant on the Kern Plateau especially in mesic areas and is vulnerable to habitat alteration. Typical habitats are variable depending on the locality, ranging from mesic red fir/lodgepole pine at mid- to upper elevations of the Plateau, to subalpine (wet meadow) habitats at high elevations in the Sierra Nevada, to springs located in desert scrub (Wake, et al. 2002). The habitat is of limited extent, especially the springs of the Kern Plateau and Scodie Mountains. The habitats are vulnerable to degradation through capping of springs by humans or other alterations (Adkins Giese et al 2012). General life history traits appear to be similar to most other Batrachoseps.

Information on population status and trend is not available, but the species is considered to be rare in most of its range and populations are declining (Adkins Giese et al 2012).). Many of the known localities are in heavily used recreation areas for off road vehicles, with logging roads and high to moderate road density. Wildfire risk is moderate to high on the Kern Plateau, at the lower elevations of its range, and wildfire has

impacted the Scodie Mountain populations (Hansen and Wake 2005). Timber harvesting and hazard tree removal on the Kern Plateau are currently planned. Water diversions are a threat on the Kern Plateau where the salamanders use springs and moist areas; water diversions from the occupied springs would likely reduce the extent of the wetted in-channel and riparian areas. Climate change has the potential to impact all populations if snow pack and runoff conditions are significantly altered. Reductions in snow pack, and changes in infiltration that reduce spring flow and riparian development could affect the Kern Plateau and Scodie Mountains populations. The climate change modeling completed by Wright, et al. (2013) indicated a slight reduction (up to 20%) in habitat suitability by the year 2050. However, recent drought goes beyond the changes envisioned in 2013.

The habitats are vulnerable to degradation through capping of springs by humans or other alterations due to drought (Adkins Giese et al 2012). In the drier portions of its range, the spring and riparian habitats it occupies are fragile and vulnerable to damage, and the threats to habitat from vegetation management and fire suppression activities continue long-term degradation of habitat are also few.

Sequoia Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Batrachoseps robustus is an endemic species that is restricted to the Kern Plateau, Sherman Peak, and the Scodie Mountains. CNDDB records include 15 occurrences in the plan area, located in these three areas.

Key ecological conditions for this species

The species is in mid- to high elevations, ranging from 4,690 to 9,190 feet (1,430 to 2,800 meters). Typical habitats are variable depending on the locality, ranging from mesic red fir/lodgepole pine at mid- to upper elevations of the Plateau, to subalpine (wet meadow) habitats at high elevations in the Sierra Nevada, to springs located in desert scrub (Wake, et al. 2002). Wake et. al (2002) hypothesize that surface activity for salamanders present at elevations below 2000 m is restricted to late winter and early spring, before surfaces heat up and lose their moisture. At high elevations, their activity is restricted to between the months of May or June to October, when temperatures are warmer and snow levels have dropped enough to provide conditions for courtship and egg-laying (Adkins Giese 2012).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Terrestrial ecosystems are diverse on the Sequoia National Forest plan area, and roughly divided into three distinct ecological environments: the Greenhorn Mountains, the Kern Plateau, and the Breckenridge, Piute, and Scodie Mountains. The integrity of ecosystems or ecological zones have been especially impacted by historic management such as surface mining, road locations, timber harvest and intensive grazing during the 1800s and early 1900s. Fire suppression has impacted riparian habitat by increasing conifer density and decreasing riparian hardwood and herbaceous vegetation. Fire suppression associated with past vegetation management has also led to increased forest density and fuel loads across the forest. Consequently, fires are more intense and uniformly severe, and forests are more vulnerable to insect and pathogen outbreaks and drought-related tree mortality (USDA 2013).

The projected status of those ecological conditions relative to the species considered

Wake et al. (2002) hypothesize that surface activity for salamanders present at elevations below 2000 m is restricted to late winter and early spring, before surfaces heat up and lose their moisture. Changes in climate such as drought or flash floods (Adkins Giese) can degrade habitat for this species, which already has a limited time of year when it is active. At high elevations, their activity is restricted to between the

months of May or June to October, when temperatures are warmer and snow levels have dropped enough to provide conditions for courtship and egg-laying (Adkins Giese 2012). Warmer temperatures coming earlier can alter the timing of emergence and activity for this species. If higher stream flows occur as a result of rain on snow then flash floods can eliminate habitat.

Timber harvest decreased substantially over the past 20 years, and as a result, ground disturbance from these activities also decreased. The potential for fire on the landscape is high. As fire severity and intervals increase, degradation and loss of habitat for this species will also increase. More climate change is expected and warmer temperatures, along with more rain than snow. This change will intensify trends in fire, insect, and pathogen, and drought-related tree mortality. Invasive plant species are also expected to increase. Once an invasive species dominates a site, fire patterns are expected to change and become more frequent. Land management activities that degrade or remove ground cover or forest litter can also further impact this species. Many of the known localities are in heavily used recreation areas, including areas subjected to unauthorized OHV travel, with logging roads and high to moderate road density.

Wildfire risk is moderate to high on the Kern Plateau, at the lower elevations of its range and wildfire has impacted the Scodie Mountain populations (Hansen and Wake 2005). Timber harvesting and hazard tree removal on the Kern Plateau are currently planned. Water diversions are a threat on the Kern Plateau where the salamanders use springs and moist areas; water diversions from the occupied springs would likely reduce the extent of the wetted in-channel and riparian areas.

Climate change has the potential to impact all populations if snow pack and runoff conditions are significantly altered. Reductions in snow pack, and changes in infiltration that reduce spring flow and riparian development could affect the Kern Plateau and Scodie Mountains populations. The climate change modeling completed by Wright, et al. (2013) indicated a slight reduction (up to 20%) in habitat suitability by the year 2050. However, recent drought goes beyond the changes envisioned in 2013.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

This species is reliant on riparian areas and changes in springs or stream morphology could impact micro-site conditions. For this salamander species, ground-based disturbance that degrades habitat through capping of springs or alterations of spring water, including unauthorized OHV travel, road construction, surface mining, vegetation treatments, and fire. This species is also vulnerable to stochastic events such as fire or climate change. Large scale fire can directly eliminate individuals and localized populations if the severity is high enough to remove forest litter and woody debris.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The Kern Plateau salamander on the Sequoia National Forest plan area is restricted to areas on the Kern Plateau, Sherman Peak and Scodie Mountains. The biggest threats to this species on the Sequoia National Forest are ground disturbing activities that degrades habitat through capping of springs or alterations of spring water, such as unauthorized OHV travel, road construction, surface mining and vegetation treatments. These factors combined with direct mortality due to predation, disease and increased stochastic fire events of high intensity, along with climate change, put the Kern Plateau slender salamander at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the Kern Plateau slender

salamander meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Relictual slender salamander - *Batrachoseps relictus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Ground disturbance associated with unauthorized OHV travel, road construction, and user created routes or fire. Fire suppression and increased conifer density. Water quantity and quality, including stream morphology and temperatures and climate change.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: S1

Other Designations: FS-SS; CA-SSC; CA-SGCN

See the description of members of the genus *Batrachoseps*, known as the slender salamanders or "worm salamanders" in the Fairview slender salamander rationale.

Relictual slender salamander was pettitoned for listing in 2015. 80 FR 37568 37579 USFWS had a postive 90 day finding on the species. It is currently under review.

This species has one of the most restricted range of slender salamanders in California. It is only found in the Breckenridge Mountains, occurring along and near the Lower Kern River, from just south of Isabella Lake; along southern side of the Kern River corridor (Jockusch 2002, 2012, USDA 2013).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

This species is endemic to the Sequoia National Forest and has the most restrictive range of all slender salamanders. There are 7 CNNDB records for this species in the Breckenridge Mountains, and records in the NRIS database. The entire known distribution for *Batrachoseps relictus* is along the Lower Kern River and two other locations on Breckenridge Mountain (Jockusch et al. 2012). All currently known populations of relictual slender salamander are above 1,700 meters in elevation, including two along Lucas Creek and one in the vicinity of Squirrel Meadow (Jockusch et al. 2012).

Key ecological conditions for this species

Key ecological conditions for this species include seeps and springs in rocky areas with sparse tree cover consisting mostly of oaks, along with scattered pines, buckeyes and sycamores in creek bottoms (Thomson et al. 2016). This species is rarely found far from surface water (Jockusch et al. 2012, Kucera 1997). On Breckenridge Mountain, the dominant vegetation is pine-fir forest and embedded seeps in upland areas or along streams is where these salamanders were found (Jockusch et al. 2012).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

B. relictus has the smallest range and is restricted to three locations on Breckenridge Mountain. On the Sequoia National Forest, the integrity of ecosystems or ecological zones have been especially impacted by nested communities, unregulated user created routes and other activities on Forest Service lands, surface mining, road construction, timber harvest, and intensive grazing during the 1800s and early 1900s. Fire suppression has impacted riparian habitat by increasing conifer density and decreasing riparian

hardwood and herbaceous vegetation. Tree mortality associated with the drought and insect outbreaks has altered the ecosystem in this area.

The projected status of those ecological conditions relative to the species considered

Surface mining, and timber harvest have decreased substantially over the past 20 years, and as a result, ground disturbance from these activities as also decreased. The potential for fire on the landscape is high. As fire severity and intervals increase, degradation and loss of habitat for this species will also increase. More climate change is expected and warmer temperatures, along with more rain than snow are occurring. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. Invasive plant species are also expected to increase, especially in the surrounding foothills. Once an invasive species dominates a site, fire patterns are expected to change and become more frequent. Land management activities that degrade or remove ground cover or forest litter can also further impact this species.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

For this salamander species, degradation of habitat, particularly sensitive spring and seep habitat has been responsible for extirpation from a significant portion of its range. Ground-based disturbance from a variety of sources in or near these sensitive aquatic habitats directly impact individuals on the surface or under rocks, logs or forest litter. This species is most threatened by degradation or loss of habitat. Ground disturbance that alters or removes ground cover, including woody debris and forest litter can directly impact this species.

Road construction associated with timber harvest has been identified as a threat to *Batrachoseps relictus* habitat. Previous road construction on Breckenridge Mountain apparently eliminated a portion of the suitable microhabitat at Squirrel Meadow (Jennings and Hayes 1994; Jockusch et al. 2012). When the road was built the seep where *B. relictus* had been found was graded over destroying the original site and altering the flow of the seep by filling it with road fill.

Additional threats to this species include climate change such as decreased snow pack may influence seeps and streams used by this species (Thomson et al. 2016). This species is rarely found far from surface water and changes in stream morphology could impact micro-site conditions. *Batrachochytrium dendrobatidis* has been documented for the California slender salamander (*Batrachoseps attenuatus*), however, the actual impacts of chytridiomycosis on this species is unknown.

This species is also vulnerable to stochastic events such as fire or climate change. Large scale fire can directly eliminate individuals and localized populations if the severity is high enough to remove forest litter and woody debris. The California Department of Fish and Wildlife rated this species as being highly vulnerable to climate change (CDFW 2015). An assessment conducted in 2015 identified *Batrachoseps relictus* as a “Priority I” taxa that were identified as being the most at risk from drought related conditions (CDFW 2016).

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The relictual slender salamander is restricted to the Breckenridge Mountain area on the Sequoia National Forest. The biggest threats to this species are degradation or loss of habitat from ground disturbing activities, user created routes, temporary roads going through seeps, fire suppression activities and

changes in stream morphology that may impact riparian micro-site conditions. Habitat degradation or destruction, user created routes, local extirpations, endemism, and climate change put the relictual slender salamander at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the relictual slender salamander meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Yellow-blotched salamander - *Ensatina eschscholtzii croceator*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Ground disturbance to microsite conditions, degradation, or loss of habitat due to ground disturbance or fire. Water quantity and quality, including stream morphology and temperatures. Climate change and associated changes in rainfall and temperature.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T3

State Rank: S3

Other Designations: FS-SS; BLM-SS

The genus *Ensatina*, is the most widely-distributed plethodontid salamander in the west, with the range extending from northern British Columbia (along with Vancouver Island) all the way down to the northwestern coast of Baja, California. The genus is comprised of seven subspecies (Kutcha 2009).

Ensatinas are members of the Plethodon family or otherwise known as lungless salamanders. In general, ensatina salamanders do not need standing or flowing water for breeding or any other part of the life cycle (Nussbaum 1983, Stebbins 2003). During wet season conditions these salamanders can be near the surface and as conditions dry out, retreat to microsite areas where moisture can be found. Microhabitat may include surface cover such as downed branches and logs, rocks, and litter.

For terrestrial salamander species, ground disturbance from a variety of sources could directly impact individuals on the surface cover substrate, such as rocks, logs or forest vegetation litter (Olson 1999). They can also be negatively affected by fire, but their habitat may be maintained or improved with the restoration of periodic low severity fire. As these species tend to be fairly localized, trends can only be evaluated in the context of known populations and the suitable habitats within their known or potential range (USDA 2013).

Yellow-blotched ensatina are endemic to California. They occur in the lower Kern River Canyon, the Piute Mountains, Breckenridge Mountain, the Tehachapi Mountains, on Mt. Abel, Mt. Pinos, near Fort Tejon, and near Frazier-Alamo Mountain.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

This species is endemic to California and has one of the most restrictive ranges of all ensatina salamanders. There are 6 CNDDB records for this species on the Sequoia National Forest plan area,

located on the eastern side of the Breckenridge Mountains, from just south of Isabella Lake, along southern side of the Kern River corridor and on Piute Peak (Kuchta 2009). Germano (2006) also found this species to be common in tributaries to the lower Kern Canyon. There are no NRIS records on the Sequoia National Forest.

Key ecological conditions for this species

Key ecological conditions for this species includes coniferous forest, deciduous forest, oak woodland, coastal sage scrub, and chaparral under logs, bark, moss, leaf litter, and talus or in animal burrows, often near streams and creeks. Yellow-blotched salamanders are positively associated with canyon live oak, *Quercus chrysolepis*, and negatively associated with blue oak, *Q. douglassi*, (Block and Morrison, 1998). The salamanders were found under rocks and logs at an average elevation of about 1,800 feet. Usually they are found under logs or rocks, occasionally under leaf litter or other cover, often in moist canyons on northerly-facing slopes (Germano 2006).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Flat or gently sloping shelves above flood level combined with forest edge habitats support the highest abundances of ensatinas (Kuchta and Parks 2005). Ensatinas are active during the winter rainy season on very local home ranges, 6-41 meters in width (Stebbins 1954; Staub et al. 1995). Roads or motorized trails along riparian areas carry traffic in the spring when these salamanders are moving that might crush them. During the dry summer, they aestivate in underground retreats such as root cavities and rodent burrows (Stebbins 1954). Development and the cutting of living oaks illegally may threaten yellow-blotched salamanders.

Motorized trails within riparian areas, temporary road construction in riparian areas associated with timber management, and roads in narrow canyons can all cause direct mortality and effect habitat connectivity (N. Hemphill personal observations).

The projected status of those ecological conditions relative to the species considered

Recreational use of the forest is projected to increase (USDA 2013). While the potential for fire on the landscape is high; it is within the natural range of variation. As climate change reduces the snow pack, seeps and other moist areas along streams and rivers may dry affecting connectivity for this species. Warmer temperatures, may also contribute to drying of riparian habitats. Land management activities that disturb soils or block connectivity; degrade or remove ground cover or forest litter can also further impact this species.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

For this salamander species, ground-based disturbance from roads, temporary roads, motorized trails, or user created routes in riparian areas could directly impact individuals on the surface or under rocks, logs, or forest litter. This species is most threatened by degradation or loss of habitat. Ground disturbance that alters or removes ground cover, including woody debris and forest litter can directly impact this species.

Additional threats to this species include disease and natural predators. *Batrachochytrium* dendrobatidis has been documented for the California slender salamander (*Batrachoseps attenuatus*), however, the actual impacts of chytridiomycosis on the closely related Ensatina species are unknown. Natural predators

of this species likely include: spotted and striped skunks, ringtails, raccoons, gray foxes, ring-necked snakes, and various skinks, moles and shrews (Krueger 2016).

This species is also vulnerable to stochastic events such as fire or climate change. Large scale fire can directly eliminate individuals and localized populations if the high severity fire is removes riparian cover, burn the soils, litter and woody debris.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The yellow-blotched salamander on the Sequoia National Forest is restricted to the southern side of the Kern River corridor and Piute Peak area. The biggest threats to this species on the Sequoia National Forest are degradation or loss of habitat from ground disturbing activities, fire suppression activities and changes in moisture levels that may impact riparian micro-site conditions. These factors combined with direct mortality due to predation, disease, roads, motorized trails and user created routes and increased stochastic such as drought, put the yellow-blotched salamander at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the yellow-blotched salamander meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Fish

California golden trout - *Oncorhynchus mykiss aquabonita*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Hybridization with rainbow trout, competition and predation from non-native trout, grazing, recreation, limited distribution, and climate change.

Rationale for California golden trout

NatureServe Global Rank: G5

NatureServe T Rank: T1

State Rank: S1

Other Designations: CA-SSC; CA-SGCN; FS-SS

California golden trout is listed as G5, globally secure, at the species level (as rainbow trout); however, at the recognized subspecies level it is imperiled (ranked as T1). At the state level for California, the California golden trout is listed as critically imperiled (S1). It is a California species of special concern (SSC) and a species of greatest conservation need (SGCN). It is a Forest Service sensitive species for the Inyo and Sequoia National Forests.

California golden trout are native to Golden Trout Creek and the South Fork Kern River in the upper Kern River basin (Moyle 2002, Moyle 2015). These two stream systems are located in an unglaciated portion of the Sierra Nevada and apparently represent remnants of the first invasion of rainbow trout into the region, and being isolated have maintained a distinct evolutionary path (Moyle 2002). California golden trout historically inhabited streams in their natural range, but were stocked into lake habitats within the Golden Trout Creek and South Fork Kern River as well as many other habitats throughout the state and country (Moyle 2002, Stephens et al. 2004). The habitat requirements basically follow those for rainbow trout with few exceptions. Among these exceptions is rapid growth at early life stages in order to compensate for the short open water period at the higher elevations. Important habitat elements in streams include cold water, undercut banks, deep water habitats (runs and pools), and streamside vegetation (Matthews 1996, Moyle 2002). Spawning occurs once seasonal peak flows are receding, with redds being constructed in small gravel and coarse sand and at the daily high water temperatures (Knapp and Vredenburg 1996, Stephens et al. 2004). Growth to maturity is slow and the trout is apparently long lived (Moyle 2002).

The original range of the California golden trout likely extended below the present-day location of Lake Isabella; ranging from 2,600 feet to over 10,000 feet (Stephens et al. 2004). The original range changed approximately 9,000 years ago when a volcanic flow cut Golden Trout Creek off from the South Fork

Kern River and moved it to the North Fork Kern River. The present extent of this original range is restricted to above Agua Bonito Falls, just upstream of the confluence of Golden Trout Creek and the South Fork Kern River. The waterfall constitutes a barrier to upstream movement by fish, including connectivity between the populations of golden trout in each of the two primary streams containing the fish. The overall range of the golden trout has decreased primarily due to the introduction of non-native fish, mainly rainbow trout, which introgress with the golden trout. Genetically pure Golden Trout are present in Volcano Creek. The fish in Golden Trout Creek have a very low rate of introgression with rainbow trout genes and may be of conservation value. Introgressed golden trout are present in the South Fork and its primary tributaries like Fish Creek on the Sequoia National Forest. Overall numbers may be as low as 5% of the original population size (CDFW 2015). Because the range of the trout has been severely reduced and is limited to two watersheds, this distribution makes the California golden trout vulnerable to stochastic events that can lead to localized extirpations or reductions in population size. Smaller populations are subsequently vulnerable to inbreeding, which can influence long-term adaptability to changing environmental conditions. At present, if un-hybridized fish exist only in 5 km of Volcano Creek, then there are only 400-2600 'pure' golden trout left in their native range, a decrease of at least 95% from historic numbers. Knapp and Matthews (1996) reported abundance of the trout in the streams they surveyed to be very high compared to other trout species; however, these were very high numbers of very small fish that may have low fecundity (CDFW 2015).

The primary threat to California golden trout are hybridization with rainbow trout and competition and predation by brown trout (Moyle 2002, Stephens, et al. 2004). Hybridization undermines the unique genetic integrity of the golden trout which results in a loss to the gene pool of the species (Stephens et al. 2004). Loss of genetic integrity may make the species more vulnerable to changes in the environment. CDFW and the Forest Service have worked cooperatively to improve conditions for golden trout including removal of obviously hybrid fish, the establishment of barriers to prevent the upstream movement of fish other than golden trout, and the planting of sterile rainbow trout in popular recreational fisheries in close proximity to occupied golden trout waters (Stephens et al. 2004).

Grazing is another primary threat to the continued existence of golden trout (Knapp and Matthews 1996, Moyle 2002, Stephens et al. 2004), causing impacts to riparian and bank structure thereby affecting the instream habitats the trout rely upon. Livestock impacts to trout habitat, more specifically impacts associated with overgrazing, have been well studied and documented in literature. Generally, livestock impacts from overgrazing include a reduction in deep water habitats, detrimental sedimentation, reduced stream shading, loss of instream and riparian cover, and alterations in food resources. Under study conditions, riparian and instream habitat elements showed signs of recovery when livestock were excluded (Matthews 1996). In recent years, grazing intensity (as measured in numbers of animals) has decreased and several grazing allotments have been in non-use status to allow recovery of stream and riparian habitats occupied by the trout on the Inyo National Forest (Stephens et al. 2004).

The impact of recreation on the California golden trout is relatively minor; however, human activities can result in impacts to stream and riparian features and the reintroduction of undesirable fish species into occupied golden trout waters.

CDFW's state wildlife action plan listed the California golden trout as vulnerable to climate change. Climate change has the potential to further reduce the range of the California golden trout, primarily through increased water temperatures. Based on recent water temperature monitoring, daily maximum temperatures currently approach the upper thermal limit commonly recognized for rainbow trout (Matthews and Nussle 2014). Matthews and Nussle (2014) used climate change modeling which predicted water temperature increases of 1-7 degrees Centigrade. Temperature increases of this magnitude

could exceed the thermal maximum for rainbow trout in some streams and reach physiologically stressful levels in other occupied streams. Other commonly acknowledged outcomes of climate change include reduced snowpack and earlier snowmelt (CDFW 2015). Both of these impacts, in conjunction with extended drought, may make streamflow less abundant and reliable and, therefore, make the species more vulnerable to water temperature increases because of reduced volume and duration.

California golden trout is restricted in range to two headwater stream systems in the upper Kern River. In many areas in the South Fork Kern River, habitat occurs in degraded meadows characterized by poor riparian and streambank conditions and widened, shallow channels. Water temperatures currently reach physiologically stressful levels and any additional impacts that impact instream and riparian conditions could lead to further detrimental water temperature increases. Further, hybridization with other trout species may be affecting the ability and resilience of the trout to adapt to changing conditions in its natural range.

Sequoia Forest-Specific Rationale

Information on current distribution of the species on the planning unit

The distribution of the California golden trout is restricted to the South Fork Kern River system on the Sequoia National Forest and is downstream from the falls into Golden Trout Creek on the North Fork Kern River.

Key ecological conditions for this species

Key ecological conditions for California golden trout include clear and cold water, although summer temperatures can fluctuate from 3 to 20°C. California golden trout generally prefer pool habitat and congregate near emergent sedges and undercut banks (CDFW 2015). Shading of the streams by willows and other shrubs keep the daytime summer temperatures less than 21 degrees (Mathews 2016).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

On the Sequoia National Forest, 43 percent of watersheds were considered to be properly functioning, and these are the watersheds that contain habitat for Golden trout in the South Fork Kern River. Habitat fragmentation, rainbow trout, (USDA 2013).

Existing conditions of habitat and fisheries has been influenced by a variety of drivers. Among the findings from the Sierra Nevada Ecosystem Project (SNEP 1996) was that the aquatic/riparian systems were the most altered and impaired habitats of the Sierra Nevada (USDA 2013). There findings were based on the following (USDA 2013):

- Effects to riparian areas damaged by grazing, roads, past timber harvest, and recreational activities;
- Excessive sediment yield into streams remained a widespread water quality problem in the Sierra Nevada due to cattle grazing and other activities;
- Water quality impacts (increased temperatures where riparian vegetation is lacking or where deep pools are lacking).

The projected status of those ecological conditions relative to the species considered

Climate predictions for the Central Valley and the southern Sierra Nevada include increased warming, less snowpack, and earlier spring snowmelt. These changes would influence the amount of water supply that can originate from forest lands and from precipitation. Uncertainty about the water supply makes

planning for distribution of water in the future challenging (USDA 2013). A recent report by Trout Unlimited projected that western trout populations could be reduced by more than 60 percent in some areas (Williams et al. 2007) because of climate change. The adverse impacts of livestock grazing to riparian habitat have been well described and have many similar impacts to climate warming such as increased water temperatures (CDFW 2015).

Competition for water uses occurs on the Sequoia National Forest. Water for hydroelectric, flood control, irrigation or drinking water alters the flow timing and amount throughout the year. Native fish species both warm water and cold water are influenced by the changing flow conditions. Climate change is expected to reduce the supply, and may increase the competition for water use. Development and population growth will put even more demand on the available water. California counties within the bio-region are expected to increase in population by 69 percent, with the highest growth in Fresno, Kern, and Tulare Counties (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Overfishing and heavy grazing were primary stressors in the 19th and first half of the 20th century; however, current cattle management on the forest focuses on restoring the hydrologic and vegetative function of meadows in golden trout habitat. Fishing opportunities and recreation uses are expected to continue and impacts from those activities will continue to occur. Angling opportunities on the Forest do include the chance to catch California Golden Trout in their native habitat of the South Fork Kern River and Golden Trout Creek. A hatchery exists in the Cottonwood Lakes drainage which is used to transplant the Golden Trout into other lakes within the Sierra Nevada Mountains and The California Department of Wildlife is expected to continue this fish stocking program.

It is important to note that these potential threats are all addressed by the Conservation Assessment and Strategy for the California Golden Trout (Stephens et al 2004). Additionally, a Comprehensive Management Plan for the North Fork and South Forks of the Kern Wild and Scenic River was completed in September, 1994 (USDA Forest Service 1994) and provides overall management direction for the Wild and Scenic River.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The California golden trout is an endemic fish species, limited to a small portion of suitable habitat on the Sequoia National Forest. The ecological conditions the trout depends on appear generally stable and or trending in a positive direction based on current management, but there is still substantial concern for the species persistence due to its rarity coupled with the potential for genetic introgression and competition from non-native fish species. Uncertainty with regard to climate change related effects pose an additional longer term threat. As a result of its rarity and limited distribution, this species is highly susceptible to stochastic events and drying conditions that may result from increasing temperatures and other climate change related disturbance in the future. Its isolated populations put it at further risk for localized extinctions. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the California golden trout meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Central Valley hitch - *Lavinia exilicauda exilicauda*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Fragmented watershed conditions due to dams, altered flow regimes and temperatures in streams and rivers for hydroelectric power, changes in water quantity or quality; habitat loss, competition and predation from invasive species, drought and climate change.

Rationale for Species

NatureServe Global Rank: G4

NatureServe T Rank: T2T4

State Rank: S2S4

Other Designations: CA-SSC

Hitch are deep-bodied cyprinids (minnow and carp family) with a terminal, slightly upturned mouth that can grow to over 350 mm (CDFW 2018). Hitch are most closely related to California roach (*Lavinia symmetricus*) and may interbreed with one another in some areas (Avise et al. 1975). Hitch may also hybridize with Sacramento blackfish, however, offspring are apparently sterile (Moyle and Massingill 1981). Three subspecies of hitch exist in California: the Clear Lake hitch (*Lavinia exilicauda chi*), the Monterey hitch, (*Lavinia exilicauda harengus*), from the Pajaro and Salinas rivers, and Central Valley or Sacramento hitch (*Lavinia exilicauda exilicauda*), which is the type subspecies (CDFW 2018, Moyle 2015).

Habitat requirements for this species include warm, lowland, waters, clear streams, turbid sloughs, lakes and reservoirs. Hitch are omnivorous and feed upon zooplankton and insects, filamentous algae, typically at the water's surface (Moyle 2002). Juveniles tend to feed like trout in pools throughout the summer and usually during the day (Moyle 2002). Pools also provide refuge from predators or high water flow events. Reproduction is also similar to trout, in that hitch will venture into riffle areas to spawn in groups. Once eggs are fertilized and released, they will sink to the gravel layer and swell up by absorbing water, which aides in lodging the interstitial eggs securely to the stream bed (Moyle 2002, 2015).

Distribution as reported by California Fish and Wildlife report the following for *Lavinia exilicauda exilicauda*:

> Hitch were once found throughout the Sacramento and San Joaquin valleys in low elevation streams and rivers, as well as in the Delta. Today they are absent from the San Joaquin River and the lower reaches of its tributaries from Friant Dam down to the Merced River (Brown 2000, CDFG 2007). Populations have become established through introductions in a few reservoirs, such as Beardsley Reservoir, San Luis Reservoir, and Bass Lake (Fresno County). Sacramento hitch have been carried by the California Aqueduct from San Luis Reservoir to several southern California reservoirs, although it is not known if these are reproducing populations (Moyle 2002).

In the Sacramento River, hitch appear to be spread across much of their native range, up to and including Shasta Reservoir. However, populations are scattered (Moyle 2002) and found only at a few localities and in relatively low numbers (May and Brown 2002). Sacramento hitch are also present in some of the larger tributaries to the San Francisco Estuary (Leidy 2007) and in a few sloughs in the Delta.

The abundance and distribution of Central Valley hitch is poorly documented, although evidence suggests that they are much less abundant than they were historically. Their distribution is also fragmented, with largely isolated populations scattered among various streams, lakes, and reservoirs. May and Brown (2002), in a survey of Sacramento Valley streams, found hitch in small numbers at only a few valley floor locations. CDFG (2007) and Brown (2000) recorded no hitch in extensive sampling of the lower San Joaquin River. Leidy (2007) noted that hitch were present in 13 of 65 watersheds tributary to the lower San Francisco Estuary and "locally abundant" in only seven; all sites were heavily influenced by urbanization. In the Delta, once an area of great natural resource abundance (including a diversity of native fishes), Brown and May (2006) recorded only 24 hitch from an eight year seining program that captured over 43,000 fish of a variety of species. Moyle et al. (2007) captured only small numbers of hitch in a 5 year study of the fishes using the tidal sloughs and floodplain of the Cosumnes River and none in the river itself. Likewise, Nobriga et al. (2005) encountered only 174 hitch in a program that captured over 79,000 fish in the Delta. However, similar numbers were taken in extensive sampling of the Delta in 1961-62 (Turner 1966) suggesting little change in their minority status. Nevertheless, Brown and Michniuk (2007) compared electrofishing captures of native fishes in the Delta between 1980-83 and 2001-2003 and found a general decline in native fishes, including hitch. They also determined that hitch seem to be largely confined to the northern Delta. Feyrer and Healey (2002) concluded that hitch had been extirpated from the southern Delta by the time of their study (1993-94).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Lavinia exilicauda exilicauda does occur on the Sequoia National Forest in the lower Kern River near Lake Isabella (PISCES 2018); population numbers and trend are not known. Much of the historic habitat for this species was to the north outside of the plan area.

Key ecological conditions for this species

Key ecological conditions for this species include warm, lowland, waters, clear streams, turbid sloughs, lakes and reservoirs.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

On the Sequoia National Forest, 43 percent of watersheds were considered to be properly functioning, 52 percent were "functioning at risk", and five percent had" impaired" function. Habitat fragmentation, flow alteration, exotic species, road density, and road proximity to water were the most common stressors affecting watersheds that were not properly functioning (USDA 2013).

The forest manages the lands around Lake Isabella. Four hydroelectric projects are located on the Kern River. These hydroelectric projects are run off of the rivers and influence the connectivity of flows. Lake Isabella is a reservoir that was created by the earthen Isabella Dam that alters connectivity of habitat for native warm water species, alters timing and temperature of flows in the river, and is a point of introduction for highly valued non-natives into the river systems (USDA 2013).

Existing conditions of habitat and fisheries has been influenced by a variety of drivers. Among the findings from the Sierra Nevada Ecosystem Project (SNEP 1996) was that the aquatic/riparian systems

were the most altered and impaired habitats of the Sierra Nevada (USDA 2013). These findings included the following (USDA 2013):

- Effects to stream flow (through dams and diversions altering stream flow patterns and water temperatures);
- Loss of connectivity for lower elevation natives such as hard head minnows.
- Effects to riparian areas damaged by grazing and locally by dams, ditches, flumes, pipelines, roads, past timber harvest, and recreational activities;
- Excessive sediment yield into streams remained a widespread water quality problem in the Sierra Nevada due to cattle grazing and other activities;
- Water quality impacts (increased temperatures where riparian vegetation is lacking or where deep pools are lacking) and increased salinity in reservoirs when low through flow occurs (summer and drought years).

The projected status of those ecological conditions relative to the species considered

Native fish species in the Lower Kern River are influenced by Isabella Reservoir releases. Warm water native fishes are still present in the lower Kern River due to the clean, sediment free water that flows through the Lower Kern Canyon. Impacts from changes in climate, such as extended drought, has decreased water in the river. Warming temperatures can also influence quality of habitat (USDA 2013). Development and population growth will put even more demand on the available water. California counties within the bio-region are expected to increase in population by 69 percent, with the highest growth in Fresno, Kern, and Tulare Counties (USDA 2013).

Climate predictions for the Central Valley and the southern Sierra Nevada include increased warming, less snowpack, and earlier spring snowmelt. These changes would influence the amount of water supply that can originate from forest lands and from precipitation (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Activities that reduce water flow may impact this species. In addition, limited dispersal ability of this species and fragmented populations due to low head dams put it at further risk for localized extinctions. . Predation by non-native, introduced fishes is a major threat to this species. Smallmouth bass (*Micropterus dolomieu*) presumably consume juvenile Central Valley hitch.

Smaller dams and diversions that are run off of the facilities on the Kern River block the movement of warm water species, and have encouraged conditions for bass, a non-native.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The abundance and distribution of the Central Valley hitch is poorly documented, although evidence suggests that they are much less abundant than they were historically. Their distribution is also fragmented, with largely isolated populations scattered among various streams, lakes, and reservoirs. The biggest threats to this species on the Sequoia National Forest are the loss of water quality and quantity due to Lake Isabella Reservoir water management, and hydroelectric use. These factors combined with direct mortality due to predation, recreation use, stochastic events and climate change that affect water

temperatures, put the Central Valley hitch at significant risk. *There is substantial concern about this species ability to persist on the planning unit.* Based upon the evidence and supporting best available science, the Central Valley hitch meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Hardhead - *Mylopharodon conocephalus*

Is there scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern:

Yes

Relevant threats to species:

Small populations, fragmented watershed conditions due to dams, altered flow regimes and temperatures in streams, habitat loss, habitat diversion, decline in water quality, and invasive species.

Rationale for Hardhead:

NatureServe Global Rank: G3

NatureServe T Rank: None

State Rank: S3

Other Designations: CA-SGCN; FS-SS

NatureServe lists hardhead as vulnerable to extinction at both the global (G3) and state level (S3) for the entire population which includes the Sacramento-San Joaquin basin and the Russian River. In 2013, hardhead were designated on Regional Foresters Sensitive Species list.

The California State Wildlife Action Plan (SWAP) listed hardhead as a species of special concern and a species of greatest conservation need (CDFW 2015). Hardhead received a determination score of 3.4 indicating moderate concern with the highest risk factor being their sensitivity to habitat alterations associated with flow, turbidity and temperature (Moyle et al. 2015). This determination score[2] is used to

[2] Metrics for determining the status of fish species in California, where status 1 indicates the species is facing major negative factors contributing to status, through status 5 that indicates the factors have no or positive effects on status; and 2-4 are intermediate values. A full description of the rating protocol and descriptions of the factors is found in the methods section of California Fish Species of Special Concern (Moyle et al. 2015).

describe the major anthropogenic factors limiting, or potentially limiting, viability of populations of fish in California.

Hardhead are typically found in small to large streams in a low to mid-elevation environment. Hardhead may also inhabit lakes or reservoirs. All ages are omnivores though the juvenile and adult fish have a slightly different diet and tooth structure for feeding. In general these fish will eat benthic invertebrates, aquatic plants and algae, or insects. Within a stream, hardhead tend to prefer warmer temperatures than salmonids and they are often found associated with pikeminnows and suckers. According to Fangue et al. (2015) adults were lethargic at 11°C and juveniles frequently refused to swim at 11 and 16°C, but all fish swam well at 21 and 25°C. These results suggest that hardhead are well suited for sustained aerobic activity over a range of flow velocities, at moderate temperatures (ca. 16 to 21°C). Therefore the hardhead minnow is usually found in clear deep streams with a slow but present flow. Most hardhead reach sexual maturity at 3 years and spawn in the spring around April-May, though spawning may take place as late as August. Hardhead [in small streams] seldom move more than one kilometer away from home pools (Grant and Maslin 1999). Fish in larger rivers or lakes often move up to 30-75 km to find suitable spawning grounds. Though spawning may occur in pools, runs, or riffles, the bedding area will typically be characterized by gravel and rocky substrate. Upon hatching, young larval hardhead remain under vegetative cover along stream or lake margins. As the juveniles grow they may move to deeper water or be swept downstream to larger rivers below. Adult hardhead may live up to 9 or 10 years.

Historically, hardhead were regarded as widespread and locally abundant (Moyle 2002). Hardhead are still fairly widespread in the foothill streams, but their specialized habitat requirements, combined with widespread alteration of downstream habitats, has resulted in most populations being localized and isolated and more vulnerable to localized extinctions (Moyle 2002).

California’s populations of hardhead minnow, have experienced population decline overall, possibly due to habitat perturbations, including dam construction with consequent temperature changes and the introduction of non-native species to California’s mid- to low-elevation streams especially in the southern part of their range (Moyle 2002).

This species occurs in scattered tributaries of the San Joaquin River but not in the valley reaches of the river (Moyle 2002). Elevational range is 10 to 1,450 meters (http://calfish.ucdavis.edu). Hardhead minnows are found in the Kern River Upper Tehachapi-Grapevine Watershed; South Fork Kern Watershed; and rivers along the east side of the San Joaquin Valley and the Sierra and Sequoia National Forests.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Within the Sequoia National Forest plan area this species is found in the lower Kings River and lower Kern River (Moyle et. al 2015).

Key ecological conditions for this species

Key ecological conditions for this species include small to large streams in a low to mid-elevation environment; clear deep streams with a slow but present flow; occasionally clean cool lakes or reservoirs; and gravel and rocky substrate for spawning.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

On the Sequoia National Forest, the watersheds containing this species are “functioning at risk” (USDA 2013). Habitat fragmentation, flow alteration, exotic species, road density, and road proximity to water were the most common stressors affecting watersheds that were not properly functioning (USDA 2013). Hardhead occupy large and small riverine habitats in low to mid-elevations. These are the areas with hydroelectric projects such as the dam at Lake Isabella. While their historic habitats are widely altered by large, mid-elevation reservoirs that isolate populations, hardhead are able to use these habitats provided they are not heavily invaded by non-native predatory fishes such as bass.

Four hydroelectric projects are located on the Kern River. These hydroelectric projects are run off of the rivers, and do not influence timing of flows of the rivers. Outside the forest, Pine Flat Reservoir eliminates connectivity of habitat for native cool water species, Lake Isabella, is on the forest but not managed by the forest, was built on top of previous habitat for this species, blocks connectivity , and have introduced non-natives into the river systems (USDA 2013).

Existing conditions of habitat for this species has been influenced by a variety of drivers. Among the findings from the Sierra Nevada Ecosystem Project (SNEP 1996) was that the aquatic/riparian systems were the most altered and impaired habitats of the Sierra Nevada (USDA 2013). There findings were based on the following (USDA 2013):

- Effects to stream flow (through dams and diversions altering stream flow patterns and water temperatures);
- Loss of connectivity for lower elevation natives such as hard head minnows.
- Effects to riparian areas damaged by grazing and locally by dams, ditches, flumes, pipelines, roads, past timber harvest, and recreational activities;
- Water quality impacts (increased temperatures where riparian vegetation is lacking or where deep pools are lacking) and increased water temperatures in the reservoir releases when low through flow occurs (summer and drought years).

The projected status of those ecological conditions relative to the species considered

Competition for water uses occurs on the Sequoia National Forest. Water for hydroelectric, flood control, irrigation or drinking water alters the flow timing and amount throughout the year. Communities nested within the forest in the areas close to Lake Isabella require water for their homes. Water that is committed to hydroelectricity or to irrigation in the valley is generally available for this species in the lower Kern or Kings Rivers. Non-native fishes are a continuous threat to the hardhead, particularly aggressive warm water species such as bass, bluegill, and sunfish which are popular reservoir species.. Native fish species both warm water and cold water are influenced by the changing flow conditions. Climate change is expected to reduce the supply, and may increase the competition for water use. Development and population growth will put even more demand on the available water. California counties within the bio-region are expected to increase in population by 69 percent, with the highest growth in Fresno, Kern, and Tulare Counties (USDA 2013).

Climate predictions for the Central Valley and the southern Sierra Nevada include increased warming, less snowpack, and earlier spring snowmelt. These changes would influence the amount of water supply that can originate from forest lands and from precipitation. Uncertainty about the water supply makes planning for distribution of water in the future challenging (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Activities that reduce water flow may impact this species. In addition, limited dispersal ability of this species and fragmented populations due to dams put it at further risk for localized extinctions. Non-native fishes have been introduced or have invaded most waters of the range. These waters include extensive areas that were once fishless at high elevations. Sierra Nevada fisheries have largely shifted from native fishes, especially salmon and other migratory fishes, to introduced fishes (USDA 2013). Predation by non-native, introduced fishes is a major threat to this species. Smallmouth bass (*Micropterus dolomieu*) may readily consume juvenile. Additionally, predation from introduced American bullfrogs (*Rana catesbiana*) likely impact this species.

Major dams and associated reservoirs are located nearby or on the forest, on the Kings and Kern Rivers, which block the movement of cool water native fishes. Smaller dams and diversions that are run off of the river facilities on the Kern River block the movement of this species, as it is not a good jumper over low-head dams, and have encouraged conditions for bass, a predatory non-native species.

These water impoundments, which block fish access to streams, together with degraded conditions above dams, have led to loss of about 90 percent of the historic habitat in the Sierra Nevada. Local degradation of habitats has led to significant impacts on aquatic invertebrates, which make up the vast majority of aquatic species in the Sierra Nevada. Impacts to invertebrates have significant cascading effects on the food chain, carbon pathways, and energy pathways in the aquatic ecosystem. Predation by bass, a non-native significantly degrades habitat for this species.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The abundance and distribution of the hardhead is relatively well documented, and evidence suggests that they are much less abundant than they were historically. Their distribution is also fragmented, with largely isolated populations scattered among various streams, lakes, and reservoirs on the Sequoia National Forest and throughtout the range. The biggest threats to this species on the Sequoia National Forest are the loss of water quality and quantity due to hydroelectric use. These factors combined with direct mortality due to predation, recreation use, stochastic events and climate change that affect water temperatures, put the hardhead at significant risk. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the hardhead meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Kern River Rainbow Trout - *Oncorhynchus mykiss gilberti*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Hybridization with coastal rainbow trout. In plan area, competition and predation from non-native trout, grazing, recreation, limited distribution, and climate change.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T1Q

State Rank: S1

Other Designations: FS-SS; CA-SSC

The taxonomic status of Kern River rainbow trout is complicated, because of its complex evolutionary history and breeding with introduced rainbow trout, with which degraded genetic purity. However, in a subsequent analysis, Gold and Gall (1975) determined that golden trout populations were effectively isolated genetically and physically. Meristic (Gold and Gall 1975) and genetic (Berg 1987) characteristics of Kern River rainbow trout were regarded as sufficiently distinctive to warrant its subspecific status (Berg 1987). Bagley and Gall (1998), using mitochondrial and nuclear DNA, found that the Kern River rainbow was distinctive, but probably originated as the result of an early (natural) invasion of coastal rainbow trout that hybridized with Little Kern golden trout, creating a new genome. This has been more or less confirmed by analysis of genetic variation by amplified fragment length polymorphism markers for populations of rainbow trout statewide (Stephens 2007). This analysis indicates that Kern River rainbow trout represent a distinct lineage that is intermediate between coastal rainbow trout and Little

Kern golden trout. Across almost all of the historic range in the North Fork Kern River, evidence of recent hybridization with coastal rainbows, presumably of hatchery origin has degraded the genetics of this species, and introgression has occurred (e.g. Cordes et al. 20016, Stephens 2007, Stephens et al.2009, Lusardi et al.2015). The planting of non-basin rainbow trout by California and Game Fish over the years has been partially responsible for loss of genetic integrity for the species. Since about 2010, California Fish and Wildlife has been stocking infertile rainbows into the former range for Kern River Rainbow trout in preparation for the re-introduction of the genetically pure population from Sequoia National Park.

According to NatureServe (2012): Behnke (1992) grouped the Kern and Little Kern golden trout as one subspecies (*gilberti*) of *O. mykiss*, and stated that they could be recognized as separate subspecies (*gilberti* and *whitei*, respectively) provided they are kept together in the same species (*O. mykiss*). Behnke indicated that *whitei* may be indistinguishable from *gilberti*. Behnke (2002) treated these forms as three subspecies: Golden Trout Creek golden trout or California golden trout (*O. mykiss aguabonita*), Kern River rainbow trout (*O. mykiss gilberti*), and Little Kern River golden trout (*O. mykiss whitei*). This nomenclature was also used by Moyle (2002) and Stephens (2007).

Kern River rainbow trout (Jordan 1894) is endemic to the Kern River system, California. Once widely distributed in the Kern River system (probably downstream as far as Keyesville in the mainstem Kern River and downstream to Onyx on the South Fork of the Kern River), it now occurs in the Kern River from Durrwood Creek upstream to Junction Meadow. Populations established through transplantation occur in Rattlesnake Creek, Osa Creek, upper Ninemile Creek and possibly upper Peppermint Creek (Moyle 2002). Additionally, there are introduced populations of Kern River rainbows in the Kaweah-Kern River and Chagoopa Creek, which appear to have maintained their genetic integrity (CalTrout 2008).

Bagley and Gall (1998), using a variety of genetic techniques, determined that several populations, mostly located in the middle section of the Kern River drainage appeared to be unhybridized Kern River rainbow trout: Rattlesnake Cr. (in Sequoia National Park), Kern River at Kern Flat, Kern River above Rattlesnake Creek, Boreal Creek, Chagoopa Creek, Kern River at Upper Funston Meadow, Kern River above Redspur Creek, and Kern River at Junction Meadow. These populations in the middle of the historic range lacked apparent influence from California golden trout (either anthropogenic or natural) that was seen in the upper sections of the Kern and also lacked apparent rainbow trout hybridization seen in the lower sections. While Behnke (2002) doubts that pure Kern River rainbow trout still exist in their native range, recent genetic analyses suggest that at least some unhybridized populations exist as indicated above. Much of their remaining habitat is in Sequoia National Forest (at least 29 kilometers) and Sequoia National Park (over 40 kilometers). In addition, there are distinctive introduced populations in the Kaweah-Kern River and Chagoopa Creek, which have maintained their genetic identity (M. Stephens 2007).

The Kern River rainbow trout has a high probability of extinction in the next 50 to 100 years if present trends continue. It is listed as a species of special concern by both the U.S. Fish and Wildlife Service and the California Department of Fish and Game. A multi-agency management plan for the upper Kern River basin lists as its goals to “restore, protect, and enhance the native Kern River rainbow trout populations so that threatened or endangered listing does not become necessary.” The Edison Trust Fund, established as mitigation for a hydropower generating station, provides at least $200,000 each year to implement the management plan and improve fish populations in the upper Kern Basin. Funding has been provided for developing a conservation hatchery for Kern River rainbow trout, for increasing patrols of wardens in areas where the trout are fished, and for funding genetic studies (CalTrout 2008).

Moyle (2002) rated Kern River rainbow trout as " threatened or endangered; the species is likely to become extinct or extirpated in the near future (less than 25 years), unless steps are taken to save it."

Moyle et al. (2011) rated Kern River rainbow trout as "endangered," meaning “in danger of extinction in the near future if present trends continue." Jelks et al. (2008) list the species as threatened and declining.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

The Kern River rainbow trout is a subspecies endemic to the Kern River and tributaries in Tulare County and occurs on the Sequoia National Forest plan area (Moyle et. al 2015). Most populations in the section of the North Fork Kern River from Johnsondale to Fork of the Kern are of mixed genetic origin. However, a number of populations in the upper Kern River basin still largely represent the native genotype, and these are on the Sequoia National Park (Erickson 2013).

Key ecological conditions for this species

Key ecological conditions for Kern River rainbow trout include sufficient water quality and quantity, which includes cold water less than 24 degrees C, with pooling habitat, undercut banks, and emergent vegetation. Connectivity of habitat is required with no non-native trout present.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

On the Sequoia National Forest, the watersheds in areas where native trout should be able to persist are generally in the “functioning at risk” category. Habitat fragmentation, flow alteration, exotic species, road density, and road proximity to water were the most common stressors affecting watersheds that were not properly functioning (USDA 2013).

Existing conditions of habitat and fisheries has been influenced by a variety of drivers. The Sierra Nevada Ecosystem Project (SNEP 1996) report the aquatic/riparian systems were the most altered and impaired habitats of the Sierra Nevada (USDA 2013). There findings were based on (USDA 2013):

- Effects to riparian areas damaged by grazing and locally by, roads, past timber harvest, and recreational activities
- Excessive sediment yield into streams remained a widespread water quality problem in the Sierra Nevada due to cattle grazing and other activities
- Water quality impacts (increased temperatures where riparian vegetation is lacking or where deep pools are lacking) and increased salinity in reservoirs when low through flow occurs (summer and drought years)

The projected status of those ecological conditions relative to the species considered

Little competition for water uses exists above Johnsondale on the North Fork Kern River on the Sequoia National Forest. This species requires cold water which is influenced by warming nighttime temperatures and prolonged drought.

Climate predictions for the Central Valley and the southern Sierra Nevada include increased warming, less snowpack, and earlier spring snowmelt. These changes would influence the amount of water supply that can originate from forest lands and from precipitation. Uncertainty about the water supply makes planning for distribution of water in the future challenging (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

The primary threats to remaining populations of Kern River rainbow trout include past hybridization with hatchery rainbow trout (O. mykiss), and further introductions of hatchery rainbow, brown, or brook trout by anglers into small isolated streams. In addition, continued grazing in riparian areas and heavy recreational use of the basin, including angling, can degrade the trout's fragile habitat. Random natural events, such as floods, drought, and fire, can also exacerbate these problems (CalTrout 2017), especially in combination with rain-on-snow flooding associated with climate change (Herbst and Cooper 2009).

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The Kern River rainbow trout is an endemic fish species, restricted to the Kern River system and occurs on the Sequoia National Forest. There is substantial concern for the species persistence due to its rarity coupled with the potential for genetic introgression and competition from non-native fish species. Uncertainty with regard to climate change related effects poses an additional longer term threat. As a result of its rarity and limited distribution, this species is highly susceptible to stochastic events and drying conditions that may result from increasing temperatures and other climate change related disturbance in the future. Its isolated populations put it at further risk for localized extinctions. Based upon the evidence and supporting best available science, the Kern River rainbow trout meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Terrestrial Invertebrates

Behr's metalmark - *Apodemia virgulti davenporti*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? **Sufficient**

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? **Yes**

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Urbanization at lower elevations, climate change, conifer encroachment, and loss of habitat from fire events.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: T2T3

State Rank: SNR

Other Designations: None

Apodemia virgulti davenporti is a rare species known from the southern Sierra Nevada. A 1964 collection of this subspecies from Sequoia National Forest was verified by Davenport in 2009. According to Emmel et al. (1998), and updated by Davenport (2004 and 2014) the subspecies is found along the Kern River in Tulare County and extends into the Southern Greenhorn Mountains, and Piute Mountains in Kern County. It is found at elevations between 4,000 to 6,000 feet. This subspecies is univoltine and according to Emmel et al. (1998) flies from mid-April to late May. Davenport et al. (2004) also indicates a flight period from April to May, but with early records in late March and late records in mid-June, probably

depend on the elevation. The larval foodplant is *Eriogonum fasciculatum*; the range of this buckwheat is much broader than the butterfly.

Distribution is reported by Davenport (2014) as:

> "Very spotty and local, but often common where found. In Kern County davenporti has populations south of Lamont Peak (Chimney Peak Road at the south end of Kern Plateau, on the east side of the Greenhorns, both west and east slopes of the Piutes (South of Bodfish and Piute Mountain Rd.), west of Sageland/Kelso Valley, Walker Pass south (including Bird Spring Pass) to Butterbredt Peak and Kelso Valley. It ranges at least as far SW as Sand Canyon in the Tehachapi's. In Tulare County, it occurs along upper Kern River (Calkin's Flat) up Sherman Pass Rd. to about 5,000', and in Lamont Peak area at south end of Kern Plateau area along Chimney Peak Road."

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

This species is known to occur on the Sequoia National Forest, as described by Davenport (2014), including in the Greenhorn Mountains and Piute Mountains. There are no records in NRIS or CNDDB.

Key ecological conditions for this species

Key ecological conditions for this species in the plan area include shrub, chaparral, woodland and mixed forest. Several kinds of arid habitats occupied by stands of suitable caterpillar host plants, primarily fasciculate buckwheat (*Eriogonum fasciculatum)*, but also Wright's buckwheat (*Eriogonum wrightii*), in open mixed deciduous conifer forest. Adult's feed nectar from flowers of *Eriogonum* and other plants.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Fasciculate buckwheat (*Eriogonum fasciculatum)* is found throughout the area near Lake Isabella, and the Southern Greenhorns. Wright's Buckwheat (*Eriogonum wrightii*), is found up in the Kern Canyon and the Greenhorn Mountains.

The projected status of those ecological conditions relative to the species considered

Invasive species, particularly cheatgrass, may spread and invade habitat.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Cheatgrass in lower elevation areas may threaten the host plants for this species. This would reduce connectivity of habitat up the Kern canyon and into the Southern Greenhorn Mountains. Drying of the habitat from drought may eliminate the host species required for this species. Drought can reduce numbers of butterflies substantially (Erlich and Murphy 1987). Warming temperatures can advance the timing of spring flight of butterflies (Forister and Shapiro 2003); the risk is that host plant phenology will not develop at the same rate causing a decline in the species. Loss of habitat at lower elevations, due to climate change and habitat destruction puts the species at risk. At higher elevations, plant phenology and distribution may not match the up slope migration of butterflies due to warming (Forister et al. 2010). Urban development and shifting climatic regimes put this species at risk.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

This butterfly is rare and localized, known from relatively few populations in the Greenhorn and Piute Mountains. Habitat is threatened by invasive species, warming temperatures, drought, and other disturbance. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, Behr's metalmark meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Evius Blue - *Plebejus icarioides evius* (Boisduval)

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Fire suppression and encroachment of conifers; climate change

Rationale for Evius Blue (included in general blues)

NatureServe Global Rank: G5 (for species, this subspecies not recognized)

NatureServe T Rank:

State Rank: SNR

Other Designations: None

The species *Plebejus icarioides* has a wide distribution with occurrences from British Columbia east to the western edge of the Great Plains, south to New Mexico, Arizona, southern California, and Baja California. Generally, this species is found in forest clearings and edges, prairie, sagebrush, chaparral, coastal dunes, fields. Many of the subspecies of *Plebejus icarioides,* blues, are rare to their known locality and do separate by species even at a puddle (Shapiro 2017). From Shapiro (2017), *Plebejus icarioides* has one brood, from April-June at Gates Canyon, and from June-August (rarely later) at higher elevations. Their host plants are many species of perennial lupines, but tend to have the preferred species varying by locality. Adults visit a great variety of flowers, including pink pussypaws, wild buckwheats, and composites. In Sierra Valley, they can often be found with the host plant far out in sagebrush steppe, where nothing (or nothing but lupine that they do not use as a nectar source) seems to be in bloom.

Plebejus icarioides evius is not recognized in NatureServe, although other subspecies of *Plebejus icarioides* are recognized. This subspecies is generally distributed in montane areas of southern California; occurring in Greenhorn, Piute and Tehachapi Mountains, Frazier Park, Mt. Pinos, Sageland-Kelso Valley (Davenport 2014). It is usually at intermediate elevations, and almost always closely associated with a lupine foodplant.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit Distribution:

The species occurs in Southern Greenhorn and Piute Mountains on the forest. Davenport (2014) reports the following occurrences in the plan area:

> *Kern County: Sierra Nevada: Pine Flat 6 June 1986 (KD). Greenhorn Mts at Shirley Meadows 6 July 1975 and 11 July 1981.*

Tulare County: Sierra Nevada: Pine Flat 6 June 1986 and 2 July 2011 (KD). Collections from upper Kern River at Fairview and Limestone 21 Apr 1997 (KD); lower Sherman Pass Rd 17 May 84 (KD) show blending with nominotypical icarioides but tend towards evius; upper Sherman Pass Rd 12 June 99 and 4 July 2004 (KD); Greenhorn Mts: W of Baker Ridge 10 and 17 June 96 (KD, blending between nominotypical icarioides and evius.

Key ecological conditions for this species

Generally distributed in montane areas at intermediate elevations, and closely associated with a lupine foodplant. Forest clearings, meadows, stream margins, and edges with buckwheat and lupines present. Caterpillars feed on lupine leaves, then flowers and seedpods. *Lupinus excubitus* is considered the primary foodplant, but the variety is not specified. Caterpillars produce a sugary secretion which is eaten by the ants that protect them. Second-stage caterpillars hibernate in old flowers or near the plants. Eriogonum and various composites provide nectar for the adult butterflies.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Forest clearings, meadows, stream margins, and edges are abundant up on the southern Greenhorn Mountains, giving a longer season than the streams in the Piute Mountains. However, Erskine Creek is perennial and provides habitat for butterflies along its margins. Different species of buckwheat (*Eriogonum*) and lupines are present across the areas. The primary larval foodplant, *Lupinus excubitus,* has a NatureServe rank of G4, which indicates the species is apparently secure.

The projected status of those ecological conditions relative to the species considered

Forest clearings, meadows, stream margins, and edges currently may be influenced by drought and warming temperatures. Climate changes such as warmer temperatures, less snowpack, earlier snowpack melting, and drought may influence butterfly emergence and flight timing, and numbers of generations per year. The flowering phenology responds to temperature increase and earlier snowmelt due to climate change. The long term risk for this butterfly is that asynchronies in their host plant availability (Dunne et al. 2003), and their emergence timing put this species at risk.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Encroachment of meadows, drought, and invasion of non-native grass may restrict this species. Climate changes such as warmer temperatures, less snowpack, earlier snowpack melting, and drought.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Evius blue is at the northern end of its range on the Sequoia National Forest plan area; constrained to a small range with highly patchy distribution. As a result of its rarity and limited distribution, this species is highly susceptible to stochastic events and drying conditions that may result from increasing temperatures and other climate change related disturbance. Its isolated populations put it at further risk for localized extinctions. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, this subspecies meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Greenish blue - *Plebejus saepiolus aehaja*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Fire suppression and encroachment of conifers; invasive annual grasses; climate change

Rationale for Greenish Blue

NatureServe Global Rank: G5 (for species, not subspecies)

NatureServe T Rank: None designated

State Rank: SNR

Other Designations: None

At the species level, *Plebejus saepiolus* has a wide distribution with occurrences from Alaska east across the Great Plains, to southern California. Generally, this species is found in bogs, roadsides, stream edges, open fields, meadows, and open forests. Many of the subspecies of *Plebejus saepiolus* blues are rare in their known locality. Davenport (2014) described *Plebejus saepiolus* as having one brood, from May to July, varying by elevation. Their host plants are many species of perennial clovers, but tend to have a preferred species varying by locality. Adults visit Trifolium clovers. Subspecies are likely rare within their range.

Plebejus saepiolus aehaja occurrences have been documented in Kern, Madera, Mono, Tulare, and Tuolumne Counties. The type specimen is from Tioga Pass, Mono County. Distribution records from Davenport (2014) for Kern and Tulare Counties include collected material from Sequoia-Kings Canyon National Parks that is probably nominotypical aehaja. From there this species ranges south in wet meadows and riparian streambed habitats to the south end of the Kern Plateau at Pine Flat, the Greenhorn Mountains south to Black Mountain saddle, and isolated points in the Piute Mountains. Some individuals from populations (as at Marshall Meadow in the Greenhorns and at the south end of the Kern Plateau) are very large and suggestive of southern California subspecies *P. i. hilda* (Grinnell & Grinnell) (Davenport 2014).

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

There are more than 20 occurrence records from Davenport (2014) for Kern and Tulare Counties. Several occurrences are within the boundaries of Sequoia National Forest plan area, including in the Piute Mountains, Greenhorn Mountains, Sherman Pass area, Big Meadow and Pine Flat. A larger sized population may be a different subspecies. Several records have repeated sightings for different years. The greenish blue has also been photographed by others, including Brock (2001) at Big Meadow and others (Warren 2012).

Key ecological conditions for this species

Plebejus saepiolus aehaja is found in wet meadows and riparian streambed habitats in montane ecosystems. Caterpillars and adults feed on clovers of the genus Trifolium.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Trifolium monanthum is found along Sherman Pass Road and both to the north into the Sequoia and Kings Canyon National Parks and south into the Kern Plateau. Wet meadows are plentiful on the Kern Plateau and the Greenhorn Mountains. Many of these are degraded (USDA 2013), however, plenty of water, seeps and springs are found around these wet meadows and riparian streambed habitats.

The projected status of those ecological conditions relative to the species considered

Meadows, stream margins, and edges currently are abundant up on the Kern Plateau and southern Greenhorn Mountains. Trifoium species are present throughout the landscape and can occur in both wetlands and non-wetland areas. Climate changes such as warmer temperatures, less snowpack, earlier snowpack melting, and drought may influence butterfly emergence and flight timing, and numbers of generations per year. The flowering phenology may respond to temperature increase and earlier snowmelt due to climate change. The long term outlook for this butterfly is that asynchronies in their host plant availability (Dunne et al.2003), and their emergence timing put this species at risk.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Encroachment of meadows, drought, and invasion of non-native grass may restrict this species' host food resources.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Plebejus saepiolus aehaja is endemic butterfly species of California. As a result of its rarity and limited distribution, this species is highly susceptible to stochastic events and drying conditions that may result from increasing temperatures and other climate change related disturbance. Based upon the evidence and supporting best available science, *Plebejus saepiolus aehaja* does meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Warren, A. D., K. J. Davis, N. V. Grishin, J. P. Pelham, E. M. Stangeland. 2012. Interactive Listing of American Butterflies. [30-XII-12] http://www.butterfliesofamerica.com/

Tehachapi fritillary - *Speyeria egleis tehachapina*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant Threats to Species

Fire suppression and conifer encroachment; invasive annual grasses; grazing; loss of habitat from fire events; and climate change.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T2

State Rank: S2

Other Designations: FS-SS

Speyeria egleis tehachapina is a Regional Forester's Sensitive Species (RFSS) for the Sequoia National Forest. It has limited distribution and restricted habitat that indicates this butterfly has very limited dispersal capabilities. Emmel and Emmel (1973) assessed it as "one of the rarest butterflies in North America." NatureServe indicates that it is found only in Kern County, in the Tehachapi Mountains and Piute Mountains, at elevations between 7,000 to 8,400 feet. Davenport (1983) states that the subspecies is limited to summit peaks and ridges in those mountain ranges. On public lands, the butterfly subspecies has only been found in the Sequoia National Forest. The Great Basin fritillary (*Speyeria egleis*) is the nominate species and is widely distributed throughout the western United States.

Davenport (2018) considers this rare subspecies appears to be in a serious decline and indicates that there have been no records for the butterfly in the Tehachapi Mountains and the Piute Mountains since 1998.

NatureServe (2017) indicates that the subspecies has a very limited range in two mountain ranges in Kern County but states that the butterfly apparently is "fairly common in both ranges." NatureServe (2017) further states that the "distribution data for U.S. states and Canadian provinces is known to be incomplete or has not been reviewed for this taxon" and that collectors may be a threat to the populations of this butterfly.

Distribution of the nominate species *Speyeria egleis* in the United States. The Tehachapi fritillary butterfly is restricted to localized populations in the Tehachapi and Piute mountain ranges within the Transverse Range of southern California.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

This species is restricted to the Piute Mountains on the Sequoia National Forest and Tehachapi Mountain, with few location records in CNDDB. Davenport (2014 and 2018) states the species has not been reported in either mountain range since 1998. Davenport (2018) added that with loss of habitat due to recent warming trends and long-term drought, this fritillary may be extinct, but there is possible habitat in the Piute Mountains, which is less accessible and not yet explored for butterflies.

Key ecological conditions for this species

Speyeria egleis tehachapina occurs in montane meadows, forest openings and rocky outcrops where host plant species of Viola occur (Lotts et al. 2017), perhaps a subspecies of *Viola purpurea*.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

The total area of meadows in the Sierra Nevada has decreased due to past and current land use practices such as dams, diversions, and recreation; upland vegetation encroachment from conifers and sagebrush as a result of fire suppression; or from drying due to stream channel incision (Gross and Coppoletta 2013).

Monitoring plots have been established for key area meadows under the Region 5 Range Long Term Monitoring Project. These plots are used to monitor rangeland condition and trend and the plots are re-read on a 5 year cycle. The plot locations are non-randomly selected and are located in areas within the meadow most likely to show change and transition. Generally, wetter meadows are in better condition than dry meadows most of the meadows sampled were in the mesic or wet meadow type.

The projected status of those ecological conditions relative to the species considered

Future changes in climate (i.e. increasing temperatures) combined with a change from a snow-dominated to a rain-dominated system will impact meadows due to changes in the hydrologic regime. Total meadow area may decline and wet meadows may shift to dry meadows, especially small irregularly shaped meadows at low to mid elevations (Gross and Coppoletta 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Retraction and drying of meadows due to past and current land use practices, recreation; vegetation encroachment as a result of fire suppression; or from drying due to stream channel incision.

Past suppression policies have led to conditions that can result in large areas of high severity fire that may be detrimental to meadow habitat. The Sequoia National Forest essentially abandoned even-aged reforestation management 20 years ago, in favor of stand maintenance thinning harvests intended to control density and growth of stands, generally for habitat maintenance. High fire severity can impact meadow habitat adjacent to these stands.

Livestock grazing is likely to be sustained within the planning area over the next 20 years. The amount of livestock grazing may decline to some degree due to reduced forage capacity (declining condition of upland browse, lack of fire, and timber canopy closure) and tighter administrative constraints for protection and enhancement of threatened, endangered, sensitive species habitat and other resource concerns such as water quality.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

This butterfly is extremely rare and localized; in the plan area it is found only in the Piute Mountains. Meadow habitat in the Piute Mountains is drying and may be impacted by tree encroachment, recreation, catastrophic fire events, grazing, and stream channel incision. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, the Tehachapi fritillary meets the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Aquatic Invertebrates

Western pearlshell - *Margaritifera falcata*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern

Yes

Relevant threats to species

Habitat modification, water quality degradation, and climate change.

Rationale for Western pearlshell

NatureServe Global and Taxa (subspecies) Rank, if applicable: G4G5

NatureServe State Rank: S1S2 , Nevada (SNR);

Xerces Red List Rank: Vulnerable

CA State Status:

Other Rank: CA SGCN

The Western pearlshell has a broad geographic distribution extending from California north to Alaska and inland to Idaho, Montana, Nevada, and Wyoming. They are most abundant in Idaho, Oregon, Washington, and British Columbia, Canada (Jepsen, et al. 2012). The pearlshell most commonly inhabits cool to cold rivers, but can also be found in smaller, cold headwater streams. They typically occupy areas with low velocities, low shear stress, low gradients, and stable substrates (Vannote and Minshall 1982, Toy 1998, Howard and Cuffey 2003, Stone, et al. 2004). Spatial distribution of the mussel reflects these habitat requirements and is non-uniform and aggregated in occupied streams with aggregations, also known as mussel beds, consisting of hundreds of individuals per square meter (Murphy 1942, Toy 1998).

Reproduction in freshwater mussels typically involves the female siphoning water containing sperm into the body where the eggs are fertilized. The eggs are moved into specialized structures called marsupia where they develop into tiny immature mussels called glochidia. In *M. falcata*, glochidia are released *en masse* in thousands of glochidial "packets" (called conglutinates) during a short period time, usually when the water is warming in late spring (March to July). Conglutinates resemble decaying fish tissue (O'Brien, et al. 2013), which is apparently consumed by fish which serve as an intermediate host for the development of the glochidia. All freshwater mussels require a fish host to reproduce and disperse, and salmonids (trout and salmon) are the primary species which serve this role for the western pearlshell (Jepsen, et al. 2012). The glochidia prefer to attach themselves to the gills of the host fish where the blood of the host allows for rapid growth and development. Once the glochidia develop into a juvenile mussel, they drop off of the host and begin an independent life in the streambed; however, mortality at this stage is exceedingly high. Once an individual is successfully dropped onto the substrate, it exists by siphoning water into the body to extract suspended materials which serve as a food source. Under certain circumstances, females can produce glochidia hermaphroditically which likely allows them to persist in

newly colonized areas or when population density is so low that there is limited viable sperm in the water column.

Individuals can live up to 100 years (Toy 1998). Many populations of the Western pearlshell appear to be stable, based on the continued presence of individuals in historic locations. However, many of these populations are no longer recruiting new individuals or the recruitment levels are very low and, in some cases, die offs have been observed (Howard and Cuffey 2006, Hastie and Toy 2008, Howard 2008). NatureServe (2017) has a comprehensive description of the range-wide declines that have been documented. With the exception of few coastal streams that are not impaired by impoundments, population declines have occurred extensively in California (Howard and Cuffey 2006, Howard 2008, Howard 2010, NatureServe 2017).

Because the Western pearlshell is a long-lived animal, it is an excellent indicator of habitat quality over long periods of time. They are sensitive to changes in habitat, including changes in water temperature, substrate stability, sedimentation, presence of fish host, and possibly bioaccumulation of contaminants (Vannote and Minshall 1982, Helmstetler and Cowles 2008, Jepsen, et al. 2012). Impoundments have probably had the greatest impact on *M. falcata* populations because hydropeaking water releases interrupt streamflow patterns (including timing, volume and temperature), channel morphology, and influence the presence and density of host fish species. Many types of channel alteration can affect the stability of the streambed where mussels occur including suction dredge mining, gravel extraction, and channel dredging. If these activities occur in or in close proximity to pearlshell beds, the streambed may become unstable and detrimental changes to the channel can occur with effects to water velocity, water depth, and protection from increased shear stress. Availability of the host fish species is also critical for the long-term survival of the pearlshell. Howard and Cuffey (2006) suggested the decline in mussel reproduction in the Navarro River, California corresponds to the collapse of the anadromous salmon fishery in the river. Because clear, cold water is a key habitat element required by the pearlshell, climatological changes that result in reduced streamflow, increased water temperatures, or both, may result in a further reduction in suitable habitats for the mussel or appropriate fish hosts. CDFW cited vulnerability to climate change as the reason for listing as a SGCN.

Other changes in habitat quality include the presence of contaminants, including excessive sediment. Naturally occurring and gold mining related mercury are biological contaminants that occur within *M. falcata's* range in California. Helmstetler and Cowles (2008) found elevated levels of mercury in Western pearlshell tissues; however, those levels were an order of magnitude lower than a toxicity threshold (no observable effects concentration) for the mussel. The Western pearlshell is also known to bioaccumulate other toxins, including those associated with past and present day pesticide applications (Helmstetler and Cowles 2008, Meyer, et al. 2016). Pesticide use in California's Great Central Valley has been associated with amphibian declines and some chemicals used have been found in sediments and animal tissue (Datta, et al. 1998, Davidson and Knapp 2007, Bradford, et al. 2011). Excessive sediment is also a contaminant to habitat quality and has been associated with freshwater mussel declines. Vannote and Minshall (1982) and Howard and Cuffey (2006) attributed increased sediment with declines in *M. falcata*, implicating in-channel dredging, logging, and livestock use in the affected watersheds.

The Western pearlshell has a broad distribution; however, it is in decline in most of its range and has been extirpated from many known localities. The causes for these declines are unclear, but have been associated with anthropogenic changes to habitats that either influence physical habitat features or the fish hosts that the mussels rely upon for successful reproduction. Reproduction is limited or absent in many populations and substantial die-offs have been recorded, often without any obvious cause. The species

appears to be vulnerable to climate change if water temperatures, induced by reduced streamflow and/or increased air temperatures, increase to stressful or lethal levels.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Although western pearlshell mussel is a widespread species and abundant in many locations across its range, there are numerous examples of its decline or extirpation from streams and rivers, especially in the more arid areas. Its decline has led to limited localities on the Sequoia National Forest. Database records on the Sequoia National Forest plan area include two CNDDB records along the South Fork Kern River near Monache Meadows and NRIS record locations along the Little Kern River and the lower Kern River. There is a need to document the current distribution and abundance of this species, so that if *M. falcata* populations decline in the future, those declines can be documented and protection for vulnerable populations can be provided.

Key ecological conditions for this species

Western pearlshell occurs in habitats ranging in size from small creeks, 1 to 2 meters wide, up to large rivers, wherever substrates are primarily composed of clean, coarse gravel, cobble and boulders. Optimal habitats for western pearlshell are low gradient (i.e. less than 4 percent, Howard 2010) pools with velocities ranging from about 25 to 30 centimeters per second and depths from 20 to 60 centimeters (Howard and Cuffey 2003, Stone et al. 2004). Key ecological conditions include cold creeks and rivers with clean water and where sea-run salmon or native trout persist. The ecological conditions for western pearlshell on the Sequoia National Forest plan area can be found in the South Fork Kern River and similar river systems, especially where the host fish species occurs. Although, the South Fork Kern River provides habitat for the Western pearlshell, there is little information on actual population trends or density. Documented host fishes for *M. falcata* include: cutthroat trout, rainbow/steelhead trout Chinook salmon, and brown trout, and a number of other fish are considered potential hosts.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

On the Sequoia National Forest, 43 percent of watersheds were considered to be properly functioning, 52 percent were “functioning at risk”, and five percent had” impaired” function. Habitat fragmentation, flow alteration, exotic species, road density, and road proximity to water were the most common stressors affecting watersheds that were not properly functioning (USDA 2013).

Existing conditions of habitat and fisheries has been influenced by a variety of drivers. Among the findings from the Sierra Nevada Ecosystem Project (SNEP 1996) was that the aquatic/riparian systems were the most altered and impaired habitats of the Sierra Nevada (USDA 2013). There findings were based on the following (USDA 2013):

- Effects to stream flow (through dams and diversions altering stream flow patterns and water temperatures);
- Effects to riparian areas damaged by grazing and locally by dams, ditches, flumes, pipelines, roads, past timber harvest, and recreational activities;
- Excessive sediment yield into streams remained a widespread water quality problem in the Sierra Nevada due to cattle grazing and other activities;

- Water quality impacts (increased temperatures where riparian vegetation is lacking or where deep pools are lacking) and increased salinity in reservoirs when low through flow occurs (summer and drought years).

The projected status of those ecological conditions relative to the species considered

Freshwater mussels are long-lived and relatively stationary organisms. Unlike more mobile species they are sedentary as adults and thus vulnerable to dredging, roads crossing streams and other sources of water quality impairment. Competition for water uses occurs on the Sequoia National Forest. Water for hydroelectric, flood control, irrigation or drinking water alters the flow timing and amount throughout the year. Climate change is expected to reduce the supply, and may increase the competition for water use. Development and population growth will put even more demand on the available water. California counties within the bio-region are expected to increase in population by 69 percent, with the highest growth in Fresno, Kern, and Tulare Counties (USDA 2013). Increase recreational use of the Kern may cause disruption of habitat, increased water pollution, and dislodge adults.

Climate predictions for the Central Valley and the southern Sierra Nevada include increased warming, less snowpack, and earlier spring snowmelt. These changes would influence the amount of water supply that can originate from forest lands and from precipitation. Uncertainty about the water supply makes planning for distribution of water in the future challenging (USDA 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Impacts to the western pearlshell from human-caused activities include eutrophication due to agricultural runoff and urbanization, sedimentation that smothers mussel beds, water diversions that reduce and alter instream flow regimes, mining, including suction dredge operations, introduction of exotic species, grazing, and water impoundments that reduce current velocities and allow for sediment deposition (Hovingh 2004, Lydeard et al. 2004, Strayer et al. 2004, Strayer and Downing 2006, Krueger et al. 2007).

Stream habitat degradation caused by historical grazing practices and suction dredging may have reduced the suitability of existing habitat, specifically in the Lower Kern area, where this species is historically known to have occurred. This mussel species depends on salmonid fish hosts to sustain and disperse larval clams. Since many salmonid species such as rainbow trout and salmon have experienced severe declines, western pearlshell mussels have declined as well (Krueger 2016).

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Although western pearlshell mussel is a widespread species and abundant in many locations across its range, there are numerous examples of its decline or extirpation from streams and rivers, especially in the more arid areas. Its decline has led to limited localities on the Sequoia National Forest. Competition for water uses occurs on the Sequoia National Forest. Water for hydroelectric, flood control, irrigation or drinking water alters the flow timing and amount throughout the year. Climate change is expected to reduce the supply, and may increase the competition for water use. Development and population growth will put even more demand on the available water. California counties within the bio-region are expected to increase in population by 69 percent, with the highest growth in Fresno, Kern, and Tulare Counties (USDA 2013). Increases in recreational use of the Kern River may cause disruption of habitat, increased water pollution, and dislodge adults. There is substantial concern about this species ability to persist on the planning unit. Based upon the evidence and supporting best available science, this species meets the

established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Chapter 2 – Rationale for Animal Species Not Meeting Criteria for Species of Conservation Concern

Birds

American peregrine falcon - *Falco peregrinus anatum*

Is there scientific information to conclude that there is substantial concern about species capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

American peregrine falcon individuals may face threats primarily from environmental toxins, habitat loss, human disturbance, and illegal take (NatureServe 2015).

Rationale for American peregrine falcon

NatureServe Global Rank: G4

NatureServe T Rank: T4

State Rank: S3S4

Other Designations: CA-Fully Protected; BLM-SS; USFWS-BCC

The peregrine falcon has a global ranking of G4, and the American peregrine falcon subspecies has a ranking of T4 indicating it is Apparently Secure, which is defined as “uncommon but not rare; some cause for long-term concern due to declines or other factors.” (NatureServe 2015). The California State ranking of S3S4 indicates a range of uncertainty about its status in the State which lies between Vulnerable and Apparently Secure (NatureServe 2015). The Nevada state ranking is an S2.

Peregrine Falcons breed throughout North America and the world (White et al. 2002). Three subspecies occur in California. Two subspecies migrate through or winter in California: Peale's peregrine falcon (*F. p. pealei*) breeds along the Pacific Northwestern coast from Alaska to Washington and winters south to Baja California, and the Arctic peregrine falcon (*F.p. tundrius*) breeds in the Arctic tundra and winters from Mexico to South America (White et al. 2002). The American peregrine falcon (*F. p. anatum*) is the focus of this rationale, and is the only subspecies that breeds in California. The American peregrine falcon, while mainly a resident, may also experience short-range migrations and dispersal in response to seasonal availability of prey resources (primarily waterfowl and other waterbirds) (Earnheart-Gold and Pyle 2001, White et al. 2002, NatureServe 2015).

American peregrine falcon populations declined drastically during the 1950s through the mid-1970s as a result of poisoning, mainly from organochlorine insecticides such as DDT (USFWS 1999). Following the ban on these pesticides and assisted by peregrine falcon reintroduction efforts, peregrine populations have recovered significantly (NatureServe 2015). Breeding Bird Survey data for California indicate a non-

significant increase from 1966-2013 (+2.98% per year), and from 2003-2013 (+3.80% per year) (Sauer et al. 2014). Christmas Bird Count data from across North America show a significant increase from 1966-2013 (+4.4% per year) (Soykan et al. 2016). A population viability analysis found that the Peregrine Falcon population in California was increasing, with an estimated 210 individuals in 1992 and 350 in 2012 (Wooten and Bell 2014).

Peregrine Falcons breed across a wide range of biomes in the Americas, though no habitat type appears to be preferred (White el al. 2002). Peregrine falcons typically nest on remote cliff-faces. Since recovery from its pesticide-related population crash, they have also begun nesting in urban areas, and on man-made structures including power-line towers, buoys, tall buildings and large bridges (White et al. 2002). They winter primarily along the coast and in wetland areas inhabited by large numbers of waterfowl. Peregrines prey almost entirely on other bird species, although mammalian and other prey are occasionally taken (White et al. 2002). Peregrine falcons breed and forage across a wide range of habitats in California, including hardwood or conifer forests, chaparral or other shrublands, grasslands, and urban areas, though no habitat type appears to be preferred (White et al. 2002, NatureServe 2015).

There are currently relatively few threats to peregrine falcons or their habitats. The opportunistic use of widespread habitats for nesting helps mitigate against effects of disturbance or anthropogenic changes to remote nesting sites, although low-level disturbance from rock-climbing activities has been documented (White et al. 2002). Peregrines living in urban areas of California are vulnerable to accumulation of polybrominated diphenyl ethers (PBDEs) (Newsome et al. 2010). PBDEs are flame retardants that are used on consumer goods, and have largely been phased out of products due to their detrimental effects on humans and wildlife (Newsome et al. 2010). The PBDEs present in the environment and wildlife have significantly declined in the San Francisco Bay area due to prohibition of specific fire retardants in consumer goods; likely reducing the threat of PBDEs to peregrine falcon populations in California (Sutton et al. 2014). Shooting of adults was a problem during the first half of the 1900s, but this activity has almost completely ceased. Primary causes for concern currently include illegal raiding of nests for chicks by falconers and collisions with man-made structures, including wind turbines (White et al. 2002). In contrast to other raptors which are at high risk, falcons are ranked as moderately at risk of negative population level effects from collisions with wind turbines (Beston et al. 2016). The predicted effects of climate change on Peregrine Falcon population sizes are mixed. Peregrine falcons in the Sierra Nevada are considered moderately vulnerable to climate change (Siegel et al. 2014c).

Forest-Specific Rationale

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012 and is included here for reference only.

Information on current distribution of the species on the planning unit

Anecdotal sightings occur on the Sequoia National Forest plan area, however no recent nesting behavior has been confirmed (Cordes 2018). On the Kern RD, peregrines have been known to regularly visit Bald Mountain in the summer, and Lake Isabella in the winter. Suspected nesting behavior has been observed at Bald Eagle peak in the Piute Mountains and White Dome in the Domeland Mountains, however, this has been difficult to confirm due to difficult survey terrain (S. Anderson pers. comm 2015).

According to a recent query of CDFW nest records, approximately 6 nesting attempts were recorded on what is now part of the Giant Sequoia National Monument from 1991-1997 in Tulare County, on the Western Divide Ranger District. All attempts occurred at one site, Needles, with a total of 11 young successfully fledged during that time (CDFW data 2017). The forest has not conducted surveys in the area

in recent times. There is also a regularly used nest site near Chimney Rock on the Giant Sequoia National Monument, Hume Lake Ranger District, near the Kings Canyon National Park boundary, and also outside the plan revision area.

In the NRIS database there are 3 records of peregrine falcon observed from 1991-1992 in the plan area. There are scattered detections of peregrine falcon across the forest in BISON. No records showed up in a recent query of CNNDB data.

There are many records in the plan area in the eBird database, in Tulare and Kern Counties, including in 2003 at Troy Meadows Campground, and there are many records of peregrine falcon (search *Falco peregrinus*) in the BISON database. The Sierra Nevada Bioregional Monitoring Project has been collecting monitoring data since 2009, no detections of Peregrine falcon were observed in the plan area during those surveys.

Key ecological conditions for this species (see above for additional details).

This species occupies multiple ecosystem types containing rocks (canyons, caves, mines, ledges, talus slopes, and cliffs), and or manmade habitat (buildings, bridges). The primary limiting factor for the peregrine falcon is cliffs for nesting; falcons breed near open waters like lakes, ponds, rivers, or wetlands.

According to Verner and Boss (1980), optimal habitat for peregrine falcon does not occur in the Sierra Nevada, although suitable habitat for intermediate density or use is available. On the Sequoia National Forest, cliff nesting habitat within close proximity to high quality foraging habitat (e.g. waterfowl rich lakes and streams) occurs near Lake Isabella on the Kern RD and the Western Divide RD.

Lakes and Waters

Water bodies which support prey for peregrine falcon are limited. The forest's high mountain lakes typically do not support waterfowl prey, however, peregrine falcon more typically hunt doves and Galliformes during the nesting season. The Sequoia National Forest has 96 acres of natural lakes and ponds-natural lakes and ponds are rare and the few that do occur on the forest are in wilderness. These include Maggie Lakes, Weaver Lake, Silver Lake and Coyote Lake. Lower elevation reservoirs such as Hume Lake and Lake Isabella provide alternative habitat which could support wintering habitat for peregrine falcon. These areas are also used for recreation.

Four major rivers drain parts of the Sequoia National Forest. The Kings, Kaweah, and Tule Rivers flow almost due west through deep canyons in the northwestern portion of the Greenhorn Mountains. Several smaller watersheds such as Deer Creek or White Creek flank the western side of the Greenhorn Mountains. On the southern portion of the forest, below Lake Isabella reservoir, the Kern River separates the Breckenridge Mountains from the Greenhorn Mountains. The Kern River drains the southern and eastern portions of the Greenhorns and is impounded at Lake Isabella. Upstream from the reservoir, the South Fork of the Kern River divides the Piute Mountains and Scodie Mountains from the Kern Plateau. The North Fork of the Kern River divides the Greenhorn Mountains from the Kern Plateau.

Six hydroelectric projects are located on the forest, four on the Kern River, and two on the Tule River. These hydroelectric projects are run off of the rivers, but do not influence the flows and timing of flows of the rivers.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

It is not currently known how many acres of suitable cliff habitat are located on the forest, although presumably this number remains unchanged from the reference condition.

Water quality and quantity are at present well within the natural range of variability in most areas of the forest. However, climate change is a stressor which may limit water quality and quantity in the future. Watersheds are overall in good condition, and most are able to recover from most perturbations imposed by human influence or are within the natural range of variability. A few are impaired due to water withdrawals or impoundments. Invasive species, fire, and climate change remain stressors on watershed condition. Water quality 303(d) impairment was found at Hume Lake, Deer Creek and Lake Isabella. Acidity (pH) and low dissolved oxygen were responsible for impairment. Hume Lake and Lake Isabella are human-made lakes in an area with few natural lakes.

The projected status of those ecological conditions relative to the species considered

Large cliffs, caves, and cave-like habitats should remain stable, however increased pressure from recreational rock climbing could negatively affect nesting behavior.

Groundwater is dependent on snow melt to recharge and since snowmelt occurs earlier and the elevation of snow may increase, where and when groundwater recharge occurs may change. Stream and lake levels may be influenced by spring runoff of snowmelt; low summer/fall flows; drought; or drawdown of hydroelectric reservoirs in the fall. This may influence prey availability for peregrine falcon in those areas.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Recreational climbing is likely in the Needles site area as a potential disturbance The Chimney Rock nest site (in Giant Sequoia National Monument) is closed to recreation during the nesting season (J. Cordes pers comm 2018).

Pesticides/chemicals and wind turbines are other potential risks for this species, however there have been no documented cases of poisoning for this species on the forest. There are no windfarms in close proximity to the forest and no mortalities resulting from collisions have been reported or observed. The Forest has no transmission corridors, and there are no existing or planned transmission corridors as identified in the West-Wide Energy Corridor Final Programmatic Environmental Impact Statement Nov 28 2008 and Record of Decision Jan 14 2009 passing through the Sequoia National Forest/Giant Sequoia National Monument.

It is unlikely that the Forest will see expansion of hydropower development on the rivers within the Forest since that potential has already been fully developed. Any increased energy production will be related to improved technology or expansion of existing facilities.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

American peregrine falcon is globally secure; however under the California State ranking some uncertainty exists as to whether it is secure or vulnerable. There is one regularly used nest site near Chimney Rock in the Giant Sequoia National Monument, near the Kings Canyon National Park boundary, and outside the plan revision area. Anecdotal sightings occur elsewhere on the forest, however no recent nesting behavior has been confirmed (J. Cordes pers. comm). On the Kern Ranger District, peregrines have been known to regularly visit Bald Mountain in the summer, and Lake Isabella in the winter. Suspected nesting behavior has been observed at Bald Eagle Peak in the Piutes and White Dome in the Domelands, however, this has not been confirmed due to difficult survey terrain (S. Anderson pers. comm 2015). Data on population trends is unavailable, although existing habitat is expected to remain stable for this species. Mortality from poisoning and or wind turbines have not been observed on the Sequoia National Forest. Recreational rock climbing does occur on the Sequoia National Forest, but does not overlap with nest sites that are known to occur only within the Giant Sequoia National Monument. *There is insufficient information to demonstrate substantial concern for long-term persistence in the plan area*. Based upon the evidence and supporting best available science, American peregrine falcon does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Black-backed woodpecker - *Picoides arcticus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Potential threats to the black-backed woodpecker include habitat removal (including post-fire timber harvest), climate change, and lack of habitat due to changing fire regimes or fire suppression (California Fish and Game Commission 2013).

Rationale for Black-backed woodpecker

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S2

Other Designations: None

The black-backed woodpecker has a global rank of G5 (Secure), a California State rank of S2 (Imperiled) (see additional information below regarding the California State rank; CNNDB 2016; 2018). This species is a Region 5 Forest Service Management Indicator Species (MIS), representing snags in burned forest.

Black-backed woodpeckers are endemic to North America and occur in boreal regions from south-central Alaska across Canada to Newfoundland and Nova Scotia, and south in the western United States in Montana and Washington through east-central California (AOU 1998, Dixon and Saab 2000). Occasional irruptions occur in eastern North America, south to Illinois, West Virginia, and Delaware (AOU 1998, Dixon and Saab 2000). There are no described subspecies of the black-backed woodpecker, and their morphology does not notably vary throughout their range (Dixon and Saab 2000). However, populations of black-backed woodpeckers in the Cascade and Sierra Nevada Mountains are found to be genetically distinct from those in the Rocky Mountains, Black Hills of South Dakota, and boreal regions of North America (Pierson et al. 2010).

Based on Breeding Bird Survey (BBS) data, there are an estimated 800,000 black-backed woodpeckers worldwide, with an estimated 5,000 of these birds in California (PIF 2014). However, detection probabilities for this species when performing passive point counts are relatively low making abundance estimations difficult from these types of surveys difficult (Siegel et al. 2010). In 2015, management indicator species (MIS) surveys focused on black-backed woodpeckers found 31 out of 50 randomly selected post-fire areas in the Sierra Nevada Mountains were occupied by black-backed woodpeckers (Siegel et al. 2016). On eBird, they are most commonly reported on the Inyo and Tahoe National Forests (322 and 264 observations respectively).

BBS survey data show a positive, but non-significant increase in black-backed woodpecker abundance in the Sierra Nevada Mountains between 1966 and 2013 (+5.23, 95% CI[0.54, 10.22])(Sauer et al. 2013). However, the credibility of trend estimates made using BBS data is considered low because black-backed woodpecker detections are relatively infrequent with a relative abundance of 0.02 individuals encountered per survey route in the Sierra Nevada (Sauer at al. 2013). Similarly, detection of black-backed woodpeckers during Christmas Bird Counts in California was too low to detect any clear population trends (0.0002 detections per party hour between 1966 and 2015;NAS 2015). MIS surveys conducted between 2009 and 2015 detected no significant trend in black-backed woodpecker populations within burned forests in California. In 2013, the California Department of Fish and Wildlife deemed black-backed woodpecker populations to be stable enough to not warrant listing as a state endangered species, and there is no indication that their range within California has changed since the 1940s (Grinnell and Miller 1944, Small et al. 1994, Bonham 2013).

In January 2016, CDFW released a Special Animals List (California Department of Fish and Wildlife, Special Animals List, January 2016: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406&inline=1) which ranked the black-backed woodpecker as S2 (imperiled). This imperiled ranking appears to be at odds with the May 2013 Fish and Game Commission finding in California that listing the black-backed woodpecker as Threatened or Endangered under CESA was not warranted after a careful year-long review of the species (California Fish and Game Commission 2013). The ranking of the species by CDFW as S2 was based on the records in the CNDDB database. As part of the ranking process CDFW did not consider other data sources when updating their rankings. There were 59 CNDDB records for black-backed woodpeckers which included approximately 24 records from eBird, 19 records from Institute for Bird Populations, 9 records from

NRIS (Forest Service database), and 2 records from C. Hanson; however, these are only a fraction of the sightings or records from these sources. Additionally, CNDDB did not include any records that were identified as collected by Point Blue Conservation Science (PBCS). The Forest Service is working with CDFW to update the records for the species to include all the records from Institute for Bird Populations and Point Blue Conservation Science, as well as any other sources. Prior to the CNDDB update, the state rank for the species was S3S4 (Vulnerable to Apparently Secure). The CNDDB list was updated in August 2018 and the California state rank is still S2 (imperiled).

In 2008, the black-backed woodpecker was considered for the California Bird Species of Special Concern (BSSC) list (Shuford and Gardali 2008), but it did not rank high enough to be included on the BSSC list. The black-backed woodpecker was petitioned for listing under the California Endangered Species Act (CESA) (Hanson and Cummings 2010). The California Fish and Game Commission reviewed the petition and found that listing the black-backed woodpecker as Threatened or Endangered under CESA was not warranted (California Fish and Game Commission 2013). The Commission's conclusion regarding their finding was summarized as follows:

- The lack of an apparent range retraction or changes in distribution within the range.
- The episodic cycles of high density occurrences (i.e., prey invasion, high woodpecker productivity, prey decline, and woodpecker dispersal) and the lack of current data on the cycle's impact on the long-term viability of California's black-backed woodpecker population.
- The lack of data concerning the role of green forest on the species but its apparent use as habitat.
- The trending increase in fire frequency, size, and severity as compared to the early- and mid-20th century.
- Uncertainty regarding the magnitude of the threat posed to black-backed woodpeckers by post-fire salvage logging.
- Lack of logging on approximately 80 percent of severely burnt US Forest Service (USFS) forest habitat since 2003 (i.e., 87,200 acres).
- The ongoing long-term monitoring of the species as an MIS.
- Black-backed woodpecker populations in California are not geographically isolated from populations in adjacent states.

More recently John Muir Project, Center for Biological Diversity, Blue Mountains Biodiversity Project, and others filed a petition (Hanson et al. 2012) to list the Oregon/California and Black Hills (South Dakota) populations of the black-backed woodpecker as Threatened or Endangered under the federal Endangered Species Act. The U.S. Fish and Wildlife Service prepared a 90-day finding indicating that the petitioned action may be warranted based on the information provided by the petitioners; therefore when funds become available, they will initiate a review of the status of the two populations to determine if listing the Oregon Cascades-California population and/or the Black Hills population as either subspecies or Distinct Population Segments is warranted (USFWS 2013).

In California, the species is found at middle to higher elevations in inland mountains from the Oregon border to the southern Sierra Nevada (Bond et al. 2012b). The woodpecker occurs at lower abundance in most unburned forest types and is also found in beetle-killed forests, but reaches its greatest abundance in recently (1-8 year-old) burned forests with fire killed trees (Bond et al. 2012b). Home range size is highly influenced by snag basal area and density (Siegel et al. 2014a, Casas 2016). "Black-backed woodpeckers occur at low densities in unburned forests, but because these areas are far more widespread than recently burned (<10 year old) forests, woodpeckers in 'green' forest likely account for a substantial portion of the

total population size" (Bond et al. 2012b). Fogg and others (2014) estimated black-backed woodpecker occupancy in green forest and found occupancy was higher than previously understood (0.21). In addition the authors site colonization and extinction probability in green forest were low (0.05 and 0.19, respectively) and suggest that many of the individuals detected in green forest were not just actively dispersing across the landscape in search of burned areas, but were occupying relatively stable home ranges (Fogg et al. 2014). Black-backed woodpeckers have been documented to forage in green forest (Siegel et al. 2013, Tingley et al. 2014) and sometimes nest in live trees or excavate cavities in dead portions of live trees (Bull et al. 1986, Goggans et al. 1989, Purcell 2010, Bond et al. 2012a). Some research suggests that Black-backed woodpeckers may prefer trees with softer wood for nesting (Lorenz et al. 2015).

Population trends of black-backed woodpeckers are poorly known (Bond et al. 2012b). Monitoring of the black-backed woodpecker across the 10 National Forests in the Sierra Nevada has been conducted in partnership with the Institute for Bird Populations (IBP) in burned forest habitat. Collectively the monitoring data from burned forests and from unburned "green" forests show that black-backed woodpeckers are not undergoing significant population declines.

In the most recent reporting for the black-backed woodpecker monitoring project, Siegel and others (2016), report "At this time there is no significant evidence of a temporal trend in occupancy rates during the seven years (2009-2015) we have been monitoring black-backed woodpeckers on National Forests in California, or of a broad-scale change in the species' distribution in California. Although there was a two-year decline in point-level occupancy from 2013-2014, resulting in a previously-reported marginal (P = 0.13) negative trend, this trend was no longer apparent in the 2015 surveys. Additionally, the proportion of occupied fires has remained largely constant"(Siegel et al. 2016). A study in the Black Hills of South Dakota (Rota et al. 2014) found population growth rates were positive only in habitat created by summer wildfire; however, population growth rates have not been calculated for California.

Roberts et al (2015) detected black-backed woodpeckers at unburned "green" forest transects on all forests in the Sierra Nevada except for Sequoia National Forest and the Lake Tahoe Basin Management Unit. In 2016 Roberts analyzed the 2011-2015 data and revised their previous black-backed woodpecker occupancy estimate from 2014. He found that "Although the occupancy estimates are largely similar to our previous analyses, the pattern among years implies a different interpretation of the trend over time which appears to be stable rather than strongly decreasing as we reported following the 2014 field season" (Roberts and Burnett 2016).

Potential threats to the black-backed woodpecker include climate change and lack of habitat due to changing fire regimes or fire suppression, and habitat removal, including post-fire timber harvest (Siegel et al. 2018).

Climate change is considered a potential threat to the persistence of black-backed woodpeckers. Audubon and Point Blue have both used species distribution models to model the projected future distribution of black-backed woodpeckers based on various future climate projections. The Audubon effort was done at the large scale of the United States and Canada using Breeding Bird Survey (BBS) records and Christmas Bird counts (Distler et al. 2015). However, BBS data from the Sierra Nevada are quite sparse. Bond and others (2012) note, "black-backed woodpecker occurrence data from the Breeding Bird Survey (BBS) are too sparse to make inferences about population trends in the Sierra Nevada. That paucity also makes it difficult to model the distribution of the species in current time or to project in the future (Wiens et al. 2009). The Point Blue modeling effort was focused on the state of California and used a larger number of records to model black-backed woodpecker distributions. Another modeling effort included the use of higher elevation conifer and subalpine conifer forest to model the current and projected future distribution

of black-backed woodpeckers (Stralberg and Jongsomjit 2012). These modeling efforts produced future range maps of the species and habitat which can be compared to the current modeled distribution of the species which indicate range contractions, but they did not quantify the amount of range lost.

Gardali and others (2012) used the results of the Point Blue species distribution models, as well as other factors to rank the vulnerability of birds in California. They found that the black-backed woodpecker had a climate vulnerability of 3 which was the lowest priority level (Gardali et al. 2012). Another analysis of Sierra Nevada bird species vulnerability to climate change was conducted and found that future vulnerability of the black-backed woodpecker was "presumed stable" under both climate scenarios that they considered (Siegel et al. 2014a). Siegel and others (2014) included results from the Point Blue species distribution models as one of the factors considered in the rankings.

Fire severity is considered higher today than under pre-settlement conditions, with the average fire in modern mixed-conifer and yellow pine forests on USFS lands supporting 5 to 7 times more area of stand-replacing fire than fires before Euro-American settlement (Miller et al. 2009, Miller and Safford 2012, Malleck et al. 2013, Safford and Stevens in press;*in press*in press). Fire size and fire severity have been trending up in low and mid-elevation forests on USFS lands over the last 20 to 30 years, and these trends have been linked to increasing forest fuels from historical forest management actions, fire suppression, and climate change (Miller et al. 2009, Miller and Safford 2012, Safford et al. 2012, Malleck et al. 2013). Recent fires in the Sierra Nevada have included some huge patches of stand-replacing fire, extending for thousands or even tens-of-thousands of acres. This is in direct contrast to the size of stand-replacing patches from active fire regime forests in reference landscapes of the Sierra Nevada (areas where the fire regime is minimally influenced by humans), where mean stand-replacing patch size is <4 ha and maximum patch size generally is ≤100 ha (Collins and Stephens 2010, Miller and Safford 2012, Safford and Stevens in press). Thus, these trends and predictions indicate an increase in burned forest habitat availability for black-backed woodpeckers into the future (Bond et al. 2012b, Malleck et al. 2013).

Post-fire snag removal treatments commonly referred to as "salvage treatments" have been identified as a potential threat to the persistence of black-backed woodpeckers (Siegel et al. 2018); however, treatments can vary substantially in their duration and intensity on the environment, therefore caution is recommended when discussing results of studies that examine the effects of salvage treatments across the US and Canada on black-backed woodpecker and their habitat (Bond et al. 2012b).

A recent study by Odion and Hanson (2013) suggests that post-fire logging of one third of suitable black-backed woodpecker habitat per year over the next three decades will lead to a trend towards extinction for the species. This publication, (Odion and Hanson 2013) makes a number of flawed assumptions in their analysis methodology:

1. The authors make serious errors in determining tree mortality from stand initiation. The two are related, but are not considered a method for determining mortality of trees. The authors have made the assumption that increases or decreases in stand initiation are resulting solely from fire suppression, and any changes in stand initiation could only be caused by fire. This discounts the effects of insects, disease, stand density, wind, snow, and other variables, all of which may have significant effects on stand initiation.
2. The authors also use a different definition of high severity fire (primary habitat) than the generally accepted definition of ≥50% basal area mortality. They use ≥75% basal area mortality.
3. The authors choose a static time period of 1984-2010 to analyze all fire disturbances and thereby the current rate of formation of primary black-backed woodpecker habitat. By selecting this static time period for their analysis, the authors have drastically underestimated the annual amount of high

severity fire occurring across the landscape, thereby underestimating the rate of formation of primary habitat for the black-backed woodpecker. Current science indicates that the total area of high severity burned forest in the Sierra Nevada is not lower than historic reference conditions (Miller and Safford 2012) and the size of high severity burned patches has significantly increased (Miller et al. 2009) [see also, climate change section in this narrative]. The entire western United States has experienced higher large-wildfire frequency, longer wildfire durations, and longer wildfire seasons since the mid-1980's (Westerling et al. 2006).

4. The authors assume that 33% of high severity fire acreage on public lands will be harvested annually. Actual harvest rates vary dramatically from year to year depending on a variety of factors including the number, size and location of fires on NFS lands, but even with an extreme event such as the Rim fire, salvage harvest did not approach 33%. When focusing on the proposed treatments solely for the year 2014 (an above-average year in which several large fires were being analyzed for treatments including the Rim, American, and Aspen fires) only 8.9% of suitable black-backed woodpecker habitat was proposed for treatment. This is far less than the 33% annual treatment rate assumed by Odion and Hanson (2013).

Siegel and others (2011) conducted surveys for black-backed woodpeckers in 2009 and 2010 across recent fires on national forest lands in California. "Overall, black-backed woodpecker were detected at approximately 20% of unsalvaged stations and 25% of salvaged stations, suggesting that black-backed woodpecker occurrence might not be negatively associated with salvage logging. It is clear that some areas subject to post-fire logging do contain woodpeckers and that post-fire logging does not fully preclude woodpeckers from occupying burned areas. However, since salvage logging is inter-correlated with measures of snag basal area (since snag basal area measurements were taken at the time of survey, post logging), the capacity of the current analysis to detect the full effects of salvage logging on black-backed woodpecker occupancy may be limited" (Siegel et al. 2011). The authors go on to state: "Pilot analyses indicate that after accounting for differences in snag basal area, the status of salvage logging at a survey station may not be a significant determinant of black-backed woodpecker occupancy. Certainly, multiple areas in our study area subject to salvage logging were found to be used by black-backed woodpeckers" (Siegel et al. 2011). This is in contrast to previously published findings (Hanson and North 2008).

Results from radio-telemetry studies indicate that black-backed woodpecker avoid foraging in areas where most of the snags had been removed in post-fire forest in California (Siegel et al. 2012). A subsequent study found that while there was a general absence of foraging locations within salvaged areas, the presence of salvage logged stands within a fire area does not preclude use of adjacent remaining stands by black-backed woodpecker (Siegel et al. 2013). It fact, radio tracking data obtained from three recent fires in California documented four birds nesting and foraging adjacent to large blocks of salvage harvested areas in their home ranges, and two birds foraging almost exclusively in unburned green forest adjacent to the fire.

The Forest Service tracks the amount of black-backed woodpecker burned forest habitat, as well as the fraction of this habitat that has been removed in a regional analyses. In April 2014, a regional analysis was conducted for black-backed woodpecker across the range of the black-backed woodpecker in California, analyzing treatment of suitable burned black-backed woodpecker habitat across all lands, including the 10 Sierra Nevada forests from 2006 to 2013. This regional analysis determined that on Forest Service lands across the Sierra Nevada bioregion, 21% of the acres that burned from 2006 to 2013 and are suitable for black-backed woodpeckers have been, or were proposed to be treated with post-fire timber removal. This analysis indicates that on average, only 2.6% of suitable black-backed woodpecker habitat was treated per year on National Forest System lands throughout the Sierra Nevada bioregion for the time period analyzed.

Salvage logging is not proposed on all fires and salvage logging is not completed on all fires where it has been proposed. These analyses confirm that spatial and temporally ephemeral nature of black-backed woodpecker burned forest habitat and do not indicate that burned forest habitat is not available for the species. It is expected that the total amount of habitat (and fraction removed) are going to fluctuate annually; therefore, we do not consider the amount of burned forest habitat to be a limiting factor.

We do not consider climate change, changed fire regimes, and salvage treatments threats to the persistence of black-backed woodpeckers within the plan area, even when considered cumulatively based on the BASI considered. It appears that black-backed woodpeckers in the Sierra Nevada have the ability to persist sustainably in certain green forest habitats, while being adapted to opportunistically exploit ephemeral habitats that are rich in prey such as beetle killed stands and high to moderate severity fire areas. Despite the local effects of past and present fire effects and climate change (even if you include salvage treatments), the upper montane forests within the Sierra Nevada are still considered within the natural range of variability, a sound proxy for considering ecosystem health and resiliency.

Sequoia National Forest-specific Rationale

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

In the NRIS database there are 205 records of Black-backed woodpecker with 210 individuals recorded since 2009 (most of these records were collected by the Institute for Bird Populations as part of an intensive study). Surveys with positive detections were conducted in the following fire perimeters from 2009 through 2016: Clover, Manter, Fish, Broder Beck, George, Lion, Tamarack, Soda, Shotgun, Cabin, Vista and Granite Fires on the Western Divide and Kern River[3] Ranger Districts. Data collected by the Sierra Nevada Avian Monitoring Information Network[4], a collaboration between Point blue and the USFS, abundance estimates increased slightly from 2015 through 2017, while occupancy rates decreased slightly but these results need to be interpreted cautiously since they are based on a very limited sample size of 3.

In eBird, there are recent (2018) sightings of black-backed woodpecker concentrated in the Greenhorn Mountains in the perimeter of the 2016 Cedar Fire. Additional sightings are scattered throughout the forest, south of Kern Peak in Tulare and Kern Counties (approximately 31 observations).

Key ecological conditions for this species (See above for additional details)

Abundant snags with abundant insect prey (wood boring beetles) and severely burned older conifer forest are key habitat needs for this species.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Montane Zone

Composition, structure, and fire regimes have changed considerably since pre-settlement times (Van de Water and Safford 2011), and are largely outside the natural range of variability in the Greenhorn

[3] http://www.birdpop.org/pages/blackBackedWoodpeckerMap.php
[4] http://data.prbo.org/apps/snamin/index.php?page=bioreg-explore-project-results-abundance&protocolname=BIOREG_DataAnalysis

Mountains. Pines and oaks have decreased substantially and shade tolerant species, such as cedar and fir, have increased.

Compared to past conditions, forest density is greater, tree canopy is denser, and small and medium trees are more dominant in the forest. Within stand variation in tree size and density has decreased. Drought has triggered tree mortality in mixed conifers; and large tree mortality has doubled in the last 2-3 decades across the western United States. This pattern is associated with increases in temperature and droughts.

Large Trees and Snags

Large tree density varies considerably by forest type. High elevation red fir, lodgepole pine and Jeffrey pine forests have relatively high mean or median densities. Trees greater than 30 inches in diameter are generally four trees per acre or more. The coefficient of variation (COV), a measure of how variable those numbers are is 122 percent. This means that the densities vary radically across the landscape. Although mean or median levels are moderate in these forest types, the coefficients of variation are often high. Mixed conifer forests have moderate but highly variable densities of trees greater than 30 inch diameter but trees greater than 40 inch diameter are sparse. These forests occur on more productive sites and trees greater than 40 inches in diameter were once more common. In ponderosa pine dominated forests, large trees (diameter greater than 30 inches) are less common and highly variable in occurrence, with mean and median densities of 2.8 and 2.0 trees per acre respectively. Hardwood-conifer and hardwood forests have relatively high densities of trees greater than 21 inch diameter (2 to 18 trees per acre) but the levels are highly variable. Densities of snags greater than 15 inches follow similar patterns by forest type but with levels at least 100 percent lower.

Insects and Pathogens

The Sequoia National Forest has been experiencing extreme drought and insect related (e.g. bark beetles, fir engravers). Mortality has been consistent across all major conifer with the most dramatic effects on fir species and ponderosa and Jeffrey pine. Statewide trends in 2017 showed that many areas experienced mortality at higher elevations (in the white and red fir) where it had was not been mapped previously, compared to previous years where most of the extensive mortality was observed in lower elevation pine and mixed conifer forests. A discussion, including a table and map summarizing mortality and estimated dead trees from 2014-2017 aerial detection surveys, is provided in the Northern Goshawk rationale. The latest map can be viewed at the Region's forest and grassland health website[5]. Black-backed woodpeckers have been observed in beetle killed trees[6].

The projected status of those ecological conditions relative to the species considered

According to a fire resilience assessment, (Fites-Kaufman et. al. 2007), low and mid-elevation mixed conifer, pine, and foothill areas are mostly low to very low resilience under all weather conditions. Under hotter, drier and windier conditions all the mid and lower elevations have low to very low resilience to fire and would be prone to high severity fire and high levels of tree mortality. On the Kern Plateau, however, Jeffrey pine and eastside mixed conifer forests have variable fire resilience and tend to be drier and more open, with slower rates of fuel accumulation-overall fire resiliency is higher. This greater resiliency may reflect the lower fuel loading, lower moisture stress, and greater use of wildland fire for resource benefit in forest ecosystems on the Kern Plateau.

According to the National Report on Sustainable Forests (USFS 2004), there is a high possibility of increased high intensity fire (resulting from climate change) that could decrease old forest and increase early seral habitat having cascading effects on patch diversity. Expected changes in climate and fire could

[5] https://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fseprd550891
[6] https://ebird.org/view/checklist/S48895994 and https://ebird.org/view/checklist/S30739449

lead to increased fragmentation of old forest and decreased fragmentation for early seral forest. With the exception of 2017, tree mortality has steadily increased the last several years.

While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sequoia National Forest substantial areas are at a low and very low fire resiliency index as described in Chapter 3 of the assessment, indicating they are susceptible to higher amounts of crown fire than expected.

Anticipated trends for red fir forest, Jeffrey and lodge pole pine and mixed conifer are similar; trending towards higher fuel loading, and changes in forest structure and composition associated with fire suppression coupled with a changing climate. In addition, projected increases (2006-2050) in mountain pine beetle activity for high-elevation white pine forest will have substantial cascading impacts on subalpine forest ecosystems, leading to outbreaks that can cause significant changes in forest structure, function, and composition (Meyer 2013).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Fire Suppression

Areas with high densities of burned snags created by fire are important for black-backed woodpecker and other species dependent on complex early seral forests. Due to fire suppression, there may be fewer total patches of snags created from fire across the landscape.

Salvage logging

Black-backed woodpeckers are irruptive species and opportunistically forage on beetle infested trees. Post-fire timber harvest, particularly right after a fire when woodpeckers move into an area can remove important foraging habitat. Salvage logging has not occurred in recent years and is not needed in areas where disturbances create complex early seral habitat for wildlife (See chapter 8 in the Living Assessment). Limited hazard tree removal occurs on a site specific basis, where snags may be a safety concern (e.g. within the perimeter of the 2016 Cedar Fire).

Timber

The Sequoia National Forest essentially abandoned even-aged reforestation management 20 years ago, in favor of stand maintenance thinning harvests intended to control density and growth of stands, generally for habitat maintenance. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production, and increases growth rates on those remaining trees.

There are over 20,000 acres of plantations on the Sequoia National Forest in need of treatment that would allow the stands to develop old forest conditions. The treatments are needed to reduce fuel loading, reduce inter-tree competition, and improve the species mix within the stands. While these plantations contain some saw log size material, the majority of the trees are only suited for biomass. There are few projects that provide adequate volume to potential markets to make the projects commercially viable. This limits the forest's ability to keep up with the pace and scale necessary to realize restoration benefits.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Based on several factors, including the black-backed woodpecker's wide range across the Sierra Nevada and Cascades; no detectable decline in California; the potential for continued favorable habitat creation

from wildfires and bark beetle outbreaks, and other forest insect and disease activity; and numerous detections within the Sequoia NF plan area, the best available scientific information about the black-backed woodpecker does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the black-backed woodpecker doesn't meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Black swift – *Cypseloides niger*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern:

No

Relevant threats to species:

Rare breeding habitat is limited primarily to cliffs near waterfalls; but also cliffs along rivers or within sea caves or cliffs. Nestlings may be fed a specialized diet of winged ants during breeding season, but this is unknown for the populations that breed in the Cascades and Sierra Nevada region.

Rationale for black swift:

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S2

Other Designations: None

The black swift has a global ranking of G4, Apparently Secure "uncommon but not rare; some cause for long-term concern due to declines or other factors". The ranking of S2 in California indicates the black swift is Imperiled: "imperiled in the state because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the state (NatureServe 2015).

Black swifts breed locally throughout western North America from southeastern Alaska to California, the Rocky Mountains, and southeastern Arizona, while two other subspecies breed in Mexico, Central America, and on Caribbean islands (AOU 1998, Lowther and Collins 2002b). The northern black swift is the only subspecies in California. Northern black swifts breed in very scattered and isolated locations throughout California. Breeding sites in California are typically behind or beside permanent or semi-permanent waterfalls, but are also found on cliffs along rivers or ocean and within sea caves (Lowther and Collins 2002b, Roberson and Collins 2008).

After breeding season black swifts migrate to their winter range, located in Central and South America (Grinnell and Miller 1944, Lowther and Collins 2002a, Roberson and Collins 2008). In California, populations have been divided into three groups, which breed along the Central Coast; in the Cascades and Sierra Nevada; and in the San Gabriel, San Bernardino, and San Jacinto Mountains (Roberson and Collins 2008). The Cascades and Sierra Nevada populations are those relevant to Forest Planning efforts for the "Next Adopters" and "Northwest Forest Plan" Forests.

According to Breeding Bird Survey data, black swift populations decreased non-significantly from 1966-2013 (-4.12% per year), and from 2003-2013 (-2.55% per year) (Sauer et al. 2014). The coastal California population, although likely small to begin with, is considered to have declined dramatically over the past 20 years and is in danger of extirpation (Roberson and Collins 2008). The Cascades and Sierra Nevada populations and the San Gabriel, San Bernardino, and San Jacinto Mountains populations are thought to be stable (Roberson and Collins 2008). There is little information on trends throughout North America (Lowther and Collins 2002a).

Studies in southern California found that over 90% of the diet fed to nestlings was winged ants (Foerster 1987, Marín 1999). These flying ants occur patchily in localized outbreaks during the summer. Foraging adults in summer cruise far from nesting locations and over a wide variety of habitat types to locate these swarms (Lowther and Collins 2002a). It is unknown if Cascades and Sierra Nevada or Central Coast populations have similarly specialized diet fed to nestlings.

Few threats to black swifts are documented and fewer still appear to have population-level effects (Roberson and Collins 2008). Climate change is considered a potential threat. Reduction in glaciers, snow pack, and precipitation may reduce stream flow and possibly affect some nesting sites. However, the population impact of this is uncertain, as birds may shift to other sites (NatureServe 2015). Deforestation of wintering areas in South America may also negatively affect black swifts but supporting data are lacking, and threats there remain speculative (Beason et al. 2012). If Cascades and Sierra Nevada populations also rely on patchy local swarms of winged ants, as is known in southern California, collapses in the prey species could seriously affect local breeding success (Roberson and Collins 2008).

Many of the threats discussed for this species are speculative and the current threat assessment for black swifts states "threat impacts over the next 10 years or three generations are difficult to assess, the overall impact over this time frame likely will be low at most" (NatureServe 2015).

The typically remote, steep, and difficult-to-access nesting sites used by this species generally are not vulnerable to outright destruction, direct major alteration, or excessive disturbance, though changes in upstream drainages could affect streamflow and consequently habitat suitability.

Because black swifts use specific and limited breeding habitats, and they possibly rely on specific prey items to feed nestlings, they currently occur and are expected to persist at low densities within California. Available information indicates their populations in the Cascades and Sierra Nevada are stable, and habitat quantity and quality appear stable. The best available scientific information about the black swift does not indicate substantial concern about the species' capability to persist over the long term in the plan area.

Sequoia National Forest-specific Rationale

According to Beedy and Pandolfino (2013), the largest Sierra Nevada breding population is in Yosemite Valley, with known and suspected breeding areas from other siloated revier gorgets from Butte to Tulare County. Foaging birds most likely observed in the lower to upper conifer zones. There is a 1985 CNDDB record in the Giant Sequoia National Monument, but not in the Sequoia National Forest planning area. There are several eBird sightings across the Sequoia National Forest plan area, with most occurring in early June. Based upon the lack of evidence and supporting best available science, the black swift does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered:

AOU. 1998. American Ornithologists' Union. Check-list of North American Birds, 7th Edition. American Ornithologists' Union, Washington, DC.

Beason, J. P., C. Gunn, K. M. Potter, R. A. Sparks, and J. W. Fox. 2012. The Northern Black Swift: migration path and wintering area revealed. Wilson Journal of Ornithology 124:1-8.

Beedy, E. and E.R. Pandolfino. Illustrated by Keith Hansen. 2013. Birds of the Sierra Nevada: Their Natural History, Status, and Distribution. University of California Press, Berkeley, CA. 430 pp.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

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Foerster, K. S. 1987. The distribution and breeding biology of the black swift (Cypseloides niger) in Southern California.

Grinnell, J., and A. H. Miller. 1944. The distribution of the birds of California. The Club.

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Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. J. Ziolkowski, and W. A. Link. 2014. Breeding Bird Survey Summary and Analysis, version 2012.1.

Calliope hummingbird - *Selasphorus calliope*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

No known threats in plan area.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: SNR

Other Designations: USFWS-BCC

Calliope hummingbirds make annual migrations from central Canada to southern Mexico, making them the smallest long-distance migrants of any bird (Beedy and Pandolfino 2013). They arrive in the Sierra Nevada by mid-April; most males depart by early July for their wintering gournds; the females and young follow later and are mostly gone by mid-August. They are considered to be fairly common nesters in the lower and upper conifer zones, the only hummers that reularly breed above the foothills. Postbreeding bireds move upslope to the subalpine and alpine zones in July and early August.

Sequoia National Forest-specific Rationale

There are many reported sightings of Calliope hummingbirds in eBird in the plan area. There is no evidence for substantial concern on the planning unit; no known local threats and no local concerns.

Best Available Scientific Information Considered

Beedy, E. and E.R. Pandolfino. Illustrated by Keith Hansen. 2013. Birds of the Sierra Nevada: Their Natural History, Status, and Distribution. University of California Press, Berkeley, CA. 430 pp.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

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Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Cassin's finch - *Carpodacus cassinii*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

No threats identified on this planning unit

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: SNR

Other Designations: USFWS Bird of Conservation Concern

Cassin's finches are considered common breeders in open lodgepole pine forests of the subalpine zone, and fairly common in red fir and mixed conifer forests of the upper conifer zone (Beedy and Pandolfino 2013). They are considered general uncommon to rare below 5,000 feet elevation. Cassin's finches feed on conifer buds on the highest branches, and seeds on grassy forest floors, in clearings, and along the edges of meadows. They breed in mid-elevation forests on the west side of the Sierra Nevada.

Sequoia National Forest-specific Rationale

There are many reported sightings of Cassin's finches in eBird in the plan area. There is no evidence for substantial concern on the planning unit; no known local threats and no local concerns.

Best Available Scientific Information Considered

Beedy, E. and E.R. Pandolfino. Illustrated by Keith Hansen. 2013. Birds of the Sierra Nevada: Their Natural History, Status, and Distribution. University of California Press, Berkeley, CA. 430 pp.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

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eBird. 2016. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Flammulated owl - *Otus flammeolus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern:

No

Relevant threats to species:

Habitat threatened by altered fire regimes, elimination of large trees/snags, and climate change.

Rationale for flammulated owl:

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S2S4

Other Designations: USFWS-BCC

The flammulated owl has a global ranking of G4, Apparently Secure which is defined as "uncommon but not rare; some cause for long-term concern due to declines or other factors". The ranking of S2S4 in California indicates a range of uncertainty about its status in the State which lies between Imperiled: "imperiled in the state because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from the state" and Apparently Secure (NatureServe 2015). This species is also a USFWS bird of conservation concern.

The flammulated owl breeds in montane forests throughout western North America from British Columbia south through central Mexico and migrates to winter as far south as El Salvador and Honduras (AOU 1998, McCallum 2013b). Population trends are unknown, however within suitable habitat, flammulated owls are considered fairly common as a breeding species in California (Garrett and Dunn

1981, Small 1994, Bezener and Fix 2000, Floyd 2007, Steel et al. 2012). While once believed to be rare, call-response surveys revealed flammulated owls are locally common in quality habitat and among the most abundant birds of prey in some areas (McCallum 1994). Their fairly common abundance is reflected in the numerous and widespread observations of this species in the eBird database (eBird 2016).

Flammulated owls use a variety of forest types during the breeding season, and prefer open to semi-open stands with larger diameter trees (>50 cm, 20 in) on slopes or ridges (Bull et al. 1990, Reynolds and Linkhart 1992, Linkhart and Reynolds 1997, McCallum 2013a, Scholer et al. 2014). In California, flammulated owls nest in a variety of habitats including ponderosa pine, Jeffrey pine, Douglas fir and red fir forests and also black oak stands (Verner and Boss 1980). They prefer low to intermediate canopy coverage; and are particularly common in suitable ponderosa pine forests (Verner and Boss 1980). They commonly select nest sites in open forests with sparse understory, although they will persist on territories where the understory has become denser (McCallum and Gehlbach 1988, McCallum 2013a).

Altered fire regimes can affect habitat suitability. Fire suppression can promote a dense understory which is unfavorable for foraging and may also increase the risk of large, high-severity fires which can eliminate mature conifer forests needed by flammulated owls (Raphael et al. 1987, McCallum 1994). Forest management activities that remove large trees and snags may also affect flammulated owl populations by eliminating suitable nest sites (Franzreb and Ohmart 1978, Raphael and White 1984). Climate change is also a threat, especially if it were to drastically alter habitat availability and forest structure through altered fire regimes, increased temperatures and more severe droughts (Lenihan et al. 2003, Franco et al. 2006, Barbero et al. 2015, Diffenbaugh et al. 2015).
In summary, the flammulated owl is fairly common throughout its range. And while it does face some stressors in the form of climate change and altered fire regimes, suitable habitat is expected to persist. The impact that climate change may have on montane forested habitats in the future is unclear. It is also unclear what if any effect climate change would have on flammulated owl populations. While flammulated owls prefer open stands with large trees, they breed in a wide range of forest conditions including a range of elevations, tree species, and tree sizes. Suitable forested conditions and available snags for nesting are expected to persist even under altered fire regimes.

Forest-Specific Rationale

Sightings reported in eBird include several from Greenhorn Mountains, Kern Plateau, Big Meadow, Cherry Hill Rd., and Clicks Creek Trail. The best available scientific information about the flammulated owl does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the flammulated owl does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

AOU. 1998. American Ornithologists' Union. Check-list of North American Birds, 7th Edition. American Ornithologists' Union, Washington, DC.

Barbero, R., J. T. Abatzoglou, N. K. Larkin, C. A. Kolden, and B. Stocks. 2015. Climate change presents increased potential for very large fires in the contiguous United States. International Journal of Wildland Fire 24:892-899.

Bezener, A., and D. Fix. 2000. Birds of Northern California. Renton, WA; Edmonton: Lone Pine Pub.

Bull, E. L., A. L. Wright, and M. G. Henjum. 1990. Nesting habitat of flammulated owls in Oregon.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

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Diffenbaugh, N. S., D. L. Swain, and D. Touma. 2015. Anthropogenic warming has increased drought risk in California. Proceedings of the National Academy of Sciences.

eBird. 2016. eBird: An Online Database of Bird Distribution and Abundance. Version 2. [Web application]. eBird, Ithaca, NY [accessed October 20, 2016]. Available from http://www.ebird.org.

Floyd, T. 2007. Atlas of the breeding birds of Nevada. University of Nevada Press.

Franco, G., D. R. Cayan, and A. Lynd Luers. 2006. Our Changing Climate: assessing the risks to California. California Climate Change Center, Report number CEC-500-2006-077.

Franzreb, K. E., and R. D. Ohmart. 1978. The effects of timber harvesting on breeding birds in a mixed-coniferous forest. The Condor 80:431-441.

Garrett, K., and J. Dunn. 1981. Birds of southern California: status and distribution. Los Angeles Audubon Society.

Lenihan, J. M., R. Drapek, D. Bachelet, and R. P. Neilson. 2003. Climate change effects on vegetation distribution, carbon, and fire in California. Ecological Applications 13:1667-1681.

Linkhart, B. D., and R. T. Reynolds. 1997. Territories of Flammulated Owls (Otus flammeolus): Is occupancy a measure of habitat quality?

McCallum, D. A. 1994. Review of technical knowledge: Flammulated Owls. Flammulated, Boreal and Great Gray Owls in the United States: a Technical Conservation Assessment. For. Ser. Gen. Tech. Rep. GTR-RM-253, Fort Collins, CO:14-46.

_____. 2013. Flammulated Owl (Otus flammeolus). The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology Available from http://bna.birds.cornell.edu/bna/species/093.

McCallum, D. A., and F. R. Gehlbach. 1988. Nest-site preferences of Flammulated Owls in western New Mexico. Condor: 653-661.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Raphael, M. G., M. L. Morrison, and M. P. Yoder-Williams. 1987. Breeding bird populations during twenty-five years of postfire succession in the Sierra Nevada. Condor: 614-626.

Raphael, M. G., and M. White. 1984. Use of snags by cavity-nesting birds in the Sierra Nevada. Wildlife monographs:3-66.

Reynolds, R. T., and B. D. Linkhart. Flammulated owls in ponderosa pine: evidence of preference for old growth. 1992 1992.

Scholer, M. N., M. Leu, and J. R. Belthoff. 2014. Factors associated with Flammulated Owl and Northern Saw-whet Owl occupancy in southern Idaho. Journal of Raptor Research 48:128-141.

Small, A. 1994. California birds. Their status and distribution. IBIS PUBLISHING, VISTA, CA. 1994.

Steel, Z. L., M. L. Bond, R. B. Siegel, and P. Pyle. 2012. Avifauna of Sierra Nevada Network Parks: Assessing distribution, abundance, stressors, and conservation opportunities for 145 bird species. Natural Resource Report NPS/SIEN/NRR-2012/506. National Park Service, Fort Collins, Colorado.

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Lewis's Woodpecker - *Melanerpes lewis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern:

No

Relevant threats to species:

Potential threats to Lewis's woodpecker include livestock grazing and fire suppression.

Rationale for Lewis's woodpecker:

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S4

Other Designations: USFWS BCC; CA SSC; CA SGCN

Lewis's woodpeckers have a global rank of G4 (Apparently Secure), a California State rank of S4 (Apparently Secure), and are recognized as a Bird of Conservation Concern by USFWS.

The Lewis's Woodpecker breeds primarily in medium-to-high-elevation open-forest habitats of the northern half of California and are considered uncommon to fairly common. Breeding Bird Survey and Christmas Bird Count data show a nonsignificant negative trend from 1966 to 2013 ranging from 2.07%-3.32% per year.

Lewis's woodpeckers breed in open canopy forested habitats including ponderosa pine, open riparian woodland, and logged or burned pine forest, with a shrub understory that provides downed woody debris and abundant insects. They typically nest in large diameter trees (~52 cm). Lewis's woodpeckers overwinter in oak woodlands and orchards, as well as other forested habitats.

Threats including historic habitat loss from urbanization and agricultural conversion are not considered relevant threats to Lewis's woodpeckers on National Forest System lands. Potential relevant threats to the Lewis's woodpecker include livestock grazing and fire suppression.

Historic loss of wildlife habitat from intensive livestock grazing is well documented (Bunn et al. 2007a). General threats from livestock grazing include altered vegetative structure and composition, as well as reduced recruitment of seedlings including aspen and oaks from either direct livestock consumption or soil compaction (Bunn et al. 2007a). Livestock grazing did not result in negative impacts to Lewis's woodpecker nest success (Newlon and Saab 2011). Empirical evidence quantifying effects of grazing on the Lewis's woodpecker is lacking. Therefore, based on what is known, livestock grazing is not considered a limiting factor for Lewis's woodpeckers within the plan area.

Fire suppression has been identified by some as a potential threat because it may reduce the creation and availability of burned forest which is considered highly suitable nesting habitat for the Lewis's woodpecker (Saab and Vierling 2001). Conversely, data indicates fire size and severity have been trending up in low and mid-elevation forests on National Forest System (NFS) lands over the last 20 to 30 years; these trends have been linked to climate change and increasing forest fuels from historic forest management such as fire suppression (Miller et al. 2009, Miller and Safford 2012, Safford et al. 2012, Malleck et al. 2013). Because Lewis's woodpeckers use burned forest, salvage logging may also be considered a threat. Some forms of salvage logging in burned forests may be unfavorable for the Lewis's woodpecker, but partially salvage logged forest retaining 50% or more of snags >23 cm had higher bird abundances than unlogged burned forests. Tracking of salvage operations on NFS lands in Region 5 show that only about 2.6% of burned habitat (greater than 50% basal area mortality) is actually salvaged any given year, although this is known to fluctuate annually.

Forest-Specific Rationale

Lewis's woodpeckers nest in the interior Coast Range but not in similar habitats in the foothills of the western Sierra (Beedy and Pandolfino 2013). They are fairly common nesters east of the crest, in open stands of ponderosa pine with a shrub component. Lewis's woodpeckers migrate across the Sierra Nevada between breeding grounds and their wintering grounds in the west side foothills. Wintering populations may swell in years when acorns are abundant. Fire suppression and the availability of burned forest habitat are not considered limiting factors for the Lewis's woodpecker within the plan area. The best available scientific information about the Lewis's woodpecker does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the **Lewis's woodpecker doesn't meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered:

Beedy, E. and E.R. Pandolfino. Illustrated by Keith Hansen. 2013. Birds of the Sierra Nevada: Their Natural History, Status, and Distribution. University of California Press, Berkeley, CA. 430 pp.

Bunn, D., A. Mummert, M. Hoshovsky, K. Gilardi, and S. Shanks. 2007. California wildlife: conservation challenges. California's Wildlife Action Plan. California Department of Fish and Game, Sacramento, CA.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

eBird. 2016. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: http://www.ebird.org.

Malleck, C. R., H. D. Safford, J. H. Viers, and J. D. Miller. 2013. Modern departures in fire severity and area vary by forest type, Sierra Nevada and southern Cascades, California, USA. Ecosphere 4(12):1-28.

Miller, J. D., and H. D. Safford. 2012. Trends in wildfire severity: 1984-2010 in the Sierra Nevada, Modoc Plateau, and southern Cascades, California, USA. Fire Ecology 8(3):41-57.

Miller, J. D., H. D. Safford, M. Crimmins, and A. E. Thode. 2009. Quantitative evidence for increasing forest fire severity in the Sierra Nevada and southern Cascade Mountains, California and Nevada, USA. Ecosystems 12:16-32.

Newlon, K. R., and V. A. Saab. 2011. Nest-site selection and nest survival of Lewis's Woodpecker in aspen riparian woodlands. The Condor 113:183-193.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Saab, V. A., and K. T. Vierling. 2001. Reproductive success of Lewis's Woodpecker in burned pine and cottonwood riparian forests. The Condor 103:491-501.

Safford, H. D., M. P. North, and M. D. Meyer. 2012. Climate change and the relevance of historical forest conditions. USDA Forest Service, Pacific Southwest Research Station, Albany, California. General Technical Report GTR-PSW-237.

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online version available at http://www.fws.gov/migratorybirds/]

Olive-sided flycatcher - *Contopus cooperi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Potential threats to the olive-sided flycatcher include use of logged and recently burned forest habitat, which is considered a potential ecological trap.

Rationale for Olive-sided flycatcher

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S4

Other Designations: CA-SSC; CA-SGCN; USFWS-BCC

The olive-sided flycatcher has a global rank of G4 (Apparently Secure), a California State rank of S4 (Apparently Secure), and is recognized as a Species of Special Concern and Species of Greatest Conservation Need by CDFW and a Bird of Conservation Concern by USFWS.

Olive-sided Flycatchers breed across Canada and throughout western North America and migrates to winter in Central and South America (AOU 1998, Altman and Sallabanks 2000). In California, they breed throughout northern California, especially along the coast and in the Sierra Nevada Mountains. They also nest in scattered high-elevation areas in southern California.

Olive-sided Flycatchers are considered uncommon to locally common as a breeding species and migrant in California (Garrett and Dunn 1981, Small 1994, Fix and Bezener 2000, Floyd et al. 2007, Widdowson 2008). However, as Grinnell and Miller noted (1944), they are highly conspicuous, and they are likely to be over represented in some surveys. Analyses of Breeding Bird Survey (BBS) data provide an estimate of 1,700,000 total Olive-sided Flycatchers worldwide (PIF 2013). BBS data indicate that California has the highest abundance of Olive-sided Flycatchers across its range with approximately 100,000 individuals within the state (PIF 2013). Although they are not recorded in the CNDDB database, they are commonly reported on eBird in all Forests within the USFS region 5.

Breeding Bird Survey data indicate a significant decrease in Olive-sided Flycatcher populations between 1966 and 2013 with a 2.94% annual decline in California (95% CI[-3.53, -2.37]) and a 3.48% annual decline across the entire BBS survey area (95% CI[-4.64, -2.84]]; Sauer et al. 2014). A study analyzing data from point count areas across the northeastern United States also detected a significant decline in that region (Ralston et al. 2015). Local extirpations from the southern Sierra Nevada have also been documented, despite no apparent change in habitat type and structure in those areas (Marshall 1988).

Olive-sided Flycatchers are associated with open canopy conifer forests and prefer forest edges adjacent to open areas with early-successional characteristics that provide high, exposed perches from which to hunt insects such as bees and wasps. Habitats used include burned forests and unburned logged or naturally occurring open forest habitat. Although there has been an increase in the availability of logged open forest since the 1800's, this may not provide high quality breeding habitat. However, the increase in forest fires has increased the availability of burned forest habitat, which is considered higher quality breeding habitat several years post fire. Extensive deforestation on wintering grounds in the Andes has resulted in widespread habitat loss.

Threats to the persistence of the olive-sided flycatcher include widespread deforestation on wintering grounds Central and South America and the use of logged and recently burned forests, although the understanding of these threats is limited. Despite high densities of Olive-sided Flycatchers occurring in logged forests, studies have found that compared with other types of habitats, including naturally burned forests, nesting success and survival rates are lower. Logged areas are documented to have higher predation rates. At least one study has also observed that the nesting success of flycatchers breeding in

recently burned forests decreased relative to those breeding in unburned areas with similar habitat structure, although sample sizes for this study were small.

It has been hypothesized that although fire may initially reduce reproductive success in this species, they still require older burned forests or a more natural fire regime. Greater nesting success was documented in burned habitats relative to unburned habitats in a forest nine years post-fire. Some suggest that ongoing fire suppression and post-fire salvage logging may also be threats to Olive-sided Flycatchers; however, fire size and severity have been trending up in low and mid-elevation forests on USFS lands over the last 20 to 30 years, and these trends have been linked to increasing forest fuels from historical forest management actions, fire suppression, and climate change (Miller et al. 2009, Miller and Safford 2012, Safford et al. 2012, Malleck et al. 2013). Tracking of salvage operations on National Forest System lands in Region 5 show that only about 2.6% of burned habitat (greater than 50% basal area mortality) is actually salvaged any given year, although this is known to fluctuate annually. Thus, the availability of higher quality breeding habitat is not considered a limiting factor for this species.

Adult survival is often high on their breeding grounds, thus declines in Olive-sided Flycatcher populations may in fact be driven by habitat loss and degradation taking place on their wintering grounds in Central and South America (Marshall 1988, Widdowson 2008, Altman and Sallabanks 2012); however, no study has yet to directly address this hypothesis.

While the olive-sided flycatcher is experiencing population declines, it is unknown whether the threat is on their breeding or wintering grounds. Suitable breeding habitat is available within the plan area and is not considered a limiting factor to the persistence of this species.

Sequoia National Forest Rationale

In eBird, there are 499 records of 851 individuals on the Sequoia National Forest and Giant Sequoia National Monument; within 5 miles of and including the Forest and National Monument, there are 721 records of 1175 individuals. There are no records in CNDDB for the Sequoia National Forest. In the Biodiversity Information serving Our Nation (BISON) database, it shows olive-sided flycatcher locations are fairly well distributed across the range of the forest plan area. The best available scientific information about the olive-sided flycatcher does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the **olive-sided flycatcher doesn't meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Osprey - *Pandion haliaetus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S4

Other Designations: None

Ospreys are considered fairly common in appropriate seasons and habitats in California. Ospreys in California and Nevada nest in large conifers near freshwater lakes and along large rivers that provide adequate fish resources for feeding young, and they winter primarily in coastal estuarine habitats. Live fish comprise over 99% of their diet and they consume a broad diversity of species across their range. Ospreys are resident year round in the region just north of San Francisco Bay and migrants winter in central and southern coastal California and on the periphery of the Central Valley (Fix and Bezener 2000). Mono Lake supports a small breeding population, where birds nest on tufa towers and forage in suitable adjacent habitat (Fields and Pagel 2016).

Breeding Bird Survey data in California showed a significant positive trend from 1966-2013 (+4.15% per year), and a nonsignificant positive trend from 2003-2013 (+4.79% per year) (Sauer et al. 2014). Christmas Bird Count data from across North America show a significant increase from 1966-2013 (+5.3 % per year) (Soykan et al. 2016). Population estimates for the entire U.S. have shown dramatic increases following the ban of DDT in 1972, growing from 8,000 breeding pairs in 1981, to 16,000-19,000 pairs in 2001 (Henny et al. 2010).

Many anthropogenic factors have affected osprey populations but few population declines due to loss of habitat are known (Bierregaard et al. 2016). Warmer and drier conditions in California associated with global climate change (Diffenbaugh et al. 2015), could lead to some water bodies having water levels so low that fish populations are not sustainable, reducing prey resources for ospreys.

Sequoia National Forest-specific Rationale

In eBird, there are 395 records of 565 individuals on the Sequoia National Forest and Giant Sequoia National Monument; within 5 miles of and including the Forest and National Monument, there are 759 records of 1111 individuals. There are no records in CNDDB for the Sequoia National Forest. In NRIS, there are 15 records of 19 individuals on the Sequoia National Forest and Giant Sequoia National Monument; within 5 miles of and including the Forest and National Monument, there are 22 records of 26

individuals. As with eBird and NRIS records, the Biodiversity Information serving Our Nation (BISON) database osprey locations in the forest plan area are mostly centered on Isabella Lake. The best available scientific information about osprey does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the **osprey does not meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Summer tanager - *Piranga rubra*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Threats to the persistence of summer tanager include loss and degradation of mature riparian habitat dominated by cottonwoods and willows.

Rationale for summer tanager

NatureServe Global Rank: G4

NatureServe T Rank: None

State Rank: S1

Other Designations: CA-SSC; CA-SGCN

The summer tanager has a global rank of G5, a California state rank of S1, and a Nevada state rank of S2B. In California, it is also recognized as a Species of Special Concern and a Species of Greatest Conservation Need by CDFW.

The summer tanager has three recognized subspecies occurring in central and eastern North America, east-central Arizona, and elsewhere in southwestern North America (Robinson 1996). The southwestern subspecies (*P. r. cooperi*) breeds locally in California and southern Nevada, primarily along the Colorado River but also in very isolated riparian patches west and north to Santa Barbara, Kern, and Inyo counties (Grinnell and Miller 1944, Unitt 2008), and in the southern tip of Nevada (Floyd et al. 2007).

Summer tanager is currently regarded as a rare to locally uncommon species in California (Small 1994). Biodiversity Information Serving Our Nation (BISON) database has a total of 5,358 occurrences in California. Extensive surveys for breeding summer tanagers during the 1980s-2000s estimated a total known breeding population of only about 100 pairs for the state of California (Unitt 2008).

Summer tanagers in California are split into two breeding groups that are undergoing substantially different population trends (Unitt 2008). Along the Colorado River bordering Arizona the species was regarded as "common" prior to the 1940s (Grinnell and Miller 1944), but by 1976 had "declined drastically" there (Rosenberg et al. 1991), and during the 1980s-2000s only 1-3 pairs could be found on the California side of the river (Unitt 2008). At the same time, however, breeding populations of summer tanagers to the north and west of the Colorado River appeared to be expanding in both range and numbers, from none prior to the 1960s to an estimated 80-90 pairs during the 2000s, about half of which occur along the South Fork of the Kern River on Sequoia National Forest (Unitt 2008). Perhaps reflecting these divergent trends, Breeding Bird Survey (BBS) data (Sauer et al. 2011) indicate non-significant increases in the summer tanager population in California, during both 1966-2010 (of +2.9%) and during 2001-2010 (+2.8%).

Summer tanagers in California breed primarily in riparian forests and river bottoms dominated by cottonwoods (*Populus fremontii*), non-native salt-cedar (*Tamarix*), and other riparian tree species (Rosenberg et al. 1991, Robinson 1996, Unitt 2008). This species is a medium to long-distant migrant, with most populations (including those of western North America) migrating to the Neotropics for winter (Robinson 1996).

The greatest threat to the persistence of summer tanagers in California is the removal, degradation, or loss of riparian forest. The California state rankings are driven by the population decline well south of the plan area along the Colorado River, their historic breeding range. Degradation includes fragmentation and lowering of water tables. The heat-moderating qualities of cottonwoods and willows are critical for nesting success. Fragmentation can reduce the availability of cooler microsites along rivers. Unnatural water regimes, including floods and extraction of groundwater, have resulted in the loss of most cottonwoods along the Colorado and Mojave Rivers. Invasion of species including tamarisk, Russian olive, and giant reed have displaced suitable summer tanager breeding habitat. Fire is a threat as it typically favors tamarisk at the expense of cottonwood.

Sequoia National Forest-specific Rationale

Summer tanagers reach the westernmost extent of their breeding range in extreme southern Sierra Nevada, primarily in tall and extensive cottonwood-willow riparian forests (Beedy and Pandolfino 2013). They breed from mid-May until mid-July and depart by the end of September for wintering areas from Central Mexico to Central America. Overall, summer tanagers are considered uncommon breeders on and near the plan area, found in the South Fork Kern River Valley (including Isabella Lake), where approximately 30 to 40 pairs have nested annually since 1985 (Beedy and Pandolfino 2013).

For a description of riparian conditions on the Sequoia National Forest, see the section “The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics” in the rationale for willow flycatcher.

Due to the stability of the population in the plan area, the best available scientific information about the summer tanager does not indicate substantial concern about the species’ capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the **summer tanager doesn’t meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Swainson's hawk - *Buteo swainsoni*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

No relevant threats identified.

Rationale for Swainson's hawk

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S3

Other Designations: CA-SSC; CA-Threatened

Swainson’s hawk has a global rank of G5 and a California State rank of S3. The Swainson’s hawk is listed as Threatened under the California Endangered Species Act and is considered a Species of Greatest Conservation Concern by CDFW. The State Rank for Nevada is a S2B.

Swainson's hawk is a monotypic species that breeds throughout western North America from southeastern Alaska to north-central Mexico and winters south through Mexico and northern South America (AOU 1998, Bechard et al. 2010). This species is highly migratory (AOU 1998, Bechard et al. 2010).

Breeding habitat can be variable, ranging from grass-dominated native habitat, sparse woodlands, and shrublands (Bechard et al. 2010). Foraging habitat includes row-crop agriculture during or after harvest, flooded agricultural fields, fields being burned (when prey are pushed to field margins), and open grassland (Bechard et al. 2010). Swainson's Hawks in California breed primarily in open grasslands and marshes that support populations of rodents, large insects such as grasshoppers, and reptiles such as lizards and snakes (Grinnell and Miller 1944, Bloom 1980, CDFG 1988, Small 1994, Bechard et al. 2010). Nests are typically located in trees near the edge of riparian vegetation, lone trees, or trees in residential neighborhoods adjacent to foraging habitat. This species is generally considered a winter visitor and transitory in nature on National Forest System lands.

Throughout North America and in California, populations of Swainson's Hawks declined substantially both in range and in abundance during the late 1800s and early 1900s due to human persecution and conversion of native grassland habitats to agriculture (Bloom 1980, Bechard et al. 2010). However, anecdotal observations suggest that numbers have increased in recent years. Swainson’s hawk is highly migratory and appears to be increasing in California. Based on Breeding Bird Survey data in California, Swainson’s hawk had large population increases from 1966-2013 (8.5% per year), and from 2003-2013 (11.26% per year) (Sauer et al. 2014). Christmas Bird Count data from across the United States indicate a non-significant decline in population size from 1966-2013 (-3.5% per year) (Soykan et al. 2016).

Extensive draining and agricultural modification of wetland-marsh and grassland habitats historically inhabited by breeding Swainson's Hawks greatly affected populations during the 1800s and early 1900s, but such degradation has substantially abated in the past 50 years. However, many anthropogenic factors still threaten Swainson's hawk populations, including conversion of natural or agricultural lands to urban sprawl or commercial properties, ‘clean’ farming techniques that leave few residual vegetation areas for prey, heavy livestock grazing that reduces cover for nesting and prey resources, and increased disturbance at nests. Along with other raptors, Swainson’s Hawks are considered to be at high risk of population decline because of wind turbines (Beston et al. 2016). Swainson’s Hawks have begun nesting in urban environments, which may help offset loss of natural habitat.

Sequoia National Forest-specific Rationale

Swainson’s hawks are fairly common breeders in the Central Valley and rare visitors to the lowest portions of the foothill zones, as far south as Fresno County. Nesting pairs are rare outside irrigated pastures and annual grasslands, however, recent nesting in the 500 feet elevation range has been observed (Beedy and Pandolfino 2013).

In eBird, there are 5 records of 5 individuals on the Sequoia National Forest and Giant Sequoia National Monument; within 5 miles of and including the Forest and National Monument, there are 74 records of 100 individuals. There is 1 record in CNDDB for the Sequoia National Forest, it is from 1992 and located in the Isabella Lake area. No nest sites are known on the forest for this species. The best available scientific information about the Swainson’s hawk does not indicate substantial concern about the species’ capability to persist over the long term in the plan area. Based upon the supporting best available science,

Swainson's hawk doesn't meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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White-faced ibis - *Plegadis chihi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Nothing known in plan area.

Rationale for Species

Species is native to and known to occur in the plan area: Yes

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S3S4

Other Designations: None

Sequoia National Forest-specific Rationale

The white-faced ibis is a common resident of the Central Valley, breeds at a few isolated marshes north of Truckee, and wanders widely after the nesting season. Numbers increased substantially following the banning of DDT. No substantial or local concerns have been noted in the plan area. In eBird, there are 28 records of 260 individuals on the Sequoia National Forest plan area; within 5 miles of and including the forest plan area, there are 103 records of 1121 individuals. There are no records in CNDDB for the Sequoia National Forest and no records in NRIS. In the Biodiversity Information serving Our Nation (BISON) database, the majority of white-faced ibis locations in the forest plan area are around Isabella Lake. The best available scientific information about this species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the supporting best available science, **white-faced ibis does not meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Williamson's sapsucker - *Sphyrapicus thyroideus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

No known threats in plan area.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: SNR

Other Designations: USFWS-BCC

Willaimson's sapsuckers primarily frequent open subalpine forests, especially those dominated by lodgepole pines, and generally nests in red firs of the upper conifer zone. Most nest records are from the lower and upper conifer zones (Beedy and Pandolfino 2013).

Sequoia National Forest-specific Rationale

Generally thought to be uncommon residents of the upper conifer to subalpine zones, and rare but annual at low elevation in winter (Beedy and Pandolfino 2013). In eBird, records are distributed across the plan area. The best available scientific information about this species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the supporting best available science, **Williamson's sapsucker does not meet** the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Yellow warbler - *Setophaga petechia*

Is there scientific information to conclude that there is substantial concern about species capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Threats include habitat loss, climate change and nest parasitism by brown-headed cowbirds.

Rationale for yellow warbler

Yellow Warblers have a broad range and can be found across much of North America. The bulk of their breeding range extends from as far north as the Arctic Circle to as far south as Arkansas. They also nest throughout the Sierra Madre Occidental. Birds breeding in these areas are migratory and winter in southern Mexico, Central America, and northern South America

There are currently 35 recognized subspecies of yellow warbler (ITIS 2017). Four yellow warbler subspecies occur in California: *S. p. brewsteri*, *S. p. morcomi*, *S. p. rubiginosa* and *S. p. sonorana*, (Grinnell and Miller 1944, NatureServe 2015). The *S. p. sonorana*, subspecies is found only along the lower Colorado River, is not present on any of the national forests in California, and is not considered further here (NatureServe 2015). *S. p. rubiginosa* is a passage migrant that breeds in Alaska and Canada and may stop in California briefly during migration (Heath 2008).

S. p. brewsteri and *S. p. morcomi* are the two subspecies known to breed on the national forests in California. *S. p. brewsteri* and *S. p. morcomi* are not consistently distinguishable from each other and *brewsteri* is best considered synonymous with *morcomi* (Patten et al. 2003, Heath 2008, NatureServe 2015).

The yellow warbler has a global ranking of G5, and the *S. p. morcomi* subspecies has a ranking of T5 indicating it is secure which is defined as “common; widespread and abundant” (NatureServe 2015). The ranking of S3S4 in California indicates a range of uncertainty about its status in California which lies between vulnerable and apparently secure (CNDDB 2016). *S. petechial* is designated as a species of special concern and both *S. petechial and S. p. morcomi* are designated as species of greatest conservation concern by the State of California.

The yellow warbler is the most common warbler species in North America. It remains very common in much of its large range and based on Breeding Bird Survey (BBS) data, the population in California is estimated at 600,000 and the global population is estimated to be 90 million individuals (PIF 2013). They are known to occur on every national forest in California. Population declines have been reported in southern California, the Central Valley and coastal California where riparian habitats have been most impacted (Heath 2008).

Yellow warblers typically breed in riparian areas near streams and wet meadows (Grinnell and Miller 1944, Lowther et al. 1999). They prefer to nest in willows and cottonwoods, but they will use many species of woody riparian plants (Grinnell and Miller 1944, Knopf and Sedgwick 1992). They place nests in dense stands of large, more mature shrubs to escape detection by predators and nest parasites (Knopf and Sedgwick 1992). They feed on a wide diversity of invertebrates, and choose prey items based on availability (Grinnell and Miller 1944, Lowther et al. 1999). In addition to riparian habitats, yellow warblers in the northern Sierra Nevada also breed in low densities in montane chaparral (Humple and Burnett 2010).

During migration yellow warblers utilize a large variety of habitat types in addition to riparian areas, including urban parks, second growth forest, and scrubby pastureland (Lowther et al. 1999).

Yellow warblers are primarily threatened by anthropogenic factors. Loss and degradation of riparian habitats on both breeding and wintering grounds is a continuing threat to this species. Human activities such as urban and agricultural development, livestock overgrazing, introduction of exotic plants, and water diversion are all major threats to riparian habitats (Katibah 1984, DeSante and George 1994, RHJV 2004, Heath 2008). Such habitat loss has been especially extensive in coastal California and the Central Valley, where the effects of urbanization and agricultural have been most severe. Over 90% of wetland habitats once used by Yellow Warblers in the Central Valley has been lost over the past 150 years (CSU Chico 2003). Clearing of native habitats to provide more open conditions for cattle grazing and the installation of feedlots have led to an increased abundance of the nest parasite brown-headed cowbird across California, which has increased pressure on many species of breeding birds, including the yellow warbler (Staab and Morrison 1997, Lowther et al. 1999, Heath 2008). Climate change is predicted to affect breeding and wintering habitat (Franco et al. 2006, Diffenbaugh et al. 2015). Climate change could potentially affect the synchronization of migration, breeding phenology and food availability on their breeding grounds (Marra et al. 2005, Both et al. 2010).

Sequoia National Forest-specific Rationale

The South Fork Kern River Valley remains a dense nesting area for the yellow warbler, due to huge tracts of riparian forest that have been restored and cowbird populations reduced (Beedy and Pandolfino 2013). In eBird, there are 620 records of 1675 individuals on the Sequoia National Forest and Giant Sequoia National Monument; within 5 miles of and including the Forest and National Monument, there are 2083 records of 6844 individuals. There are no records in CNDDB for the Sequoia National Forest and no records in NRIS. The best available scientific information about yellow warbler does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the lack of evidence and supporting best available science, the yellow warbler does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Mammals

American pika[7] - *Ochotona princeps, Ochotona princeps schisticeps*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Climate change, grazing, proximity of roads to suitable habitat.

Rationale for American pika

NatureServe Global Rank: G5

NatureServe T Rank: T4

State Rank: S2S4

Other Designations: CA-SGCN

The pika subspecies in the Sierra Nevada, *Ochotona princeps schisticeps* (Hefner & Smith 2010), has a global rank of G5 (Secure) and a subspecies rank of T4 (Apparently Secure) (NatureServe 2015). *O. princeps* is recognized as a Species of Greatest Conservation Need and a Species of Special Concern by CDFW. *O. p. schisticeps* has a California State rank of S2S4. *O princeps* has a Nevada State rank of S2.

O. p. schisticeps occupies habitats in volcanic peaks of northern California, throughout the Sierra Nevada of California and Nevada, and isolated highlands throughout the Great Basin of Nevada, eastern Oregon, and southwestern Utah. *O. p. schisticeps* are generally considered restricted to higher elevation (6,700-12,750 feet) sub-alpine to alpine zones where rock and talus slopes are adjacent to meadows, grassland, or forest edges with herbaceous understories (Smith and Weston 1990, Grayson 2005, CDFW 2016). Habitat trends suggest there is less alpine meadow habitat available when compared to pre-European times (Barbour et al. 1991); however, the vegetation types required by this subspecies are not considered a limiting factor.

This subspecies is believed to have received more scientific study than any other American pika subspecies (US FWS 2010), studies that include findings of population declines and range retraction, as well as recently discovered populations in different parts of the Great Basin (Beever et al. 2008, Jeffress et al. 2017).

Threats identified for pikas include climate change, grazing, and proximity of roads to suitable habitat (McDonald 1992, Beever et al. 2003, Stewart et al. 2015, Beever et al. 2016).

Populations throughout the range of this subspecies appear to be stable (Beever et al. 2003, USFWS 2010). There is evidence of upslope movement of pikas presumably in response to warming temperatures

[7] Gray-headed pika was the common name in 2016 rationale document.

at lower elevation sites (McDonald 1992, Beever et al. 2016). Prediction models estimating effects of climate change and the interpretation of such models on pika populations and persistence is mixed. However, based on the number of sites, diversity of sites, occupancy of sites, and elevation range of pika sites in the Sierra Nevada, Millar and Westfall (2010) suggest the greater distribution of pikas in the region may indicate a wide thermal tolerance for pikas. USFWS (2010) concluded that pika populations at mid to high elevations in the Sierra Nevada should not be at risk of extirpation by the year 2050 based on cooler projected temperatures at higher elevations. USFWS (2010) also concluded that lower elevation populations may be at higher risk based on projected warmer temperatures. Stewart et al (2015) modeled future climate change scenarios, projecting the number of occupied sites in the Sierra Nevada may decline from 39 to 88 percent by the year 2070. Millar and Westfall (2010) found pika populations in the Sierra Nevada and southwestern Great Basin are thriving, able to persist in a wide range of thermal environments, and are showing little evidence of extirpation or decline. While there is uncertainty related to climate change effects and pika persistence, it is generally agreed upon that extirpation in mainland areas, such as the Sierra Nevada, have exhibited lower rates of extirpation than more isolated or insular areas (Beever et al. 2016). Therefore, climate change and habitat availability are not considered limiting factors to the persistence of pikas within the Sierra Nevada in the long-term.

Anthropogenic influences, such as cattle or horse grazing and proximity of roads to habitat may negatively influence pikas (Beever et al. 2003). Beever and others (2003) suggest livestock grazing within 164 feet of cover (e.g., talus habitat) may increase energetic costs and predation risk to individual pikas; but caution further research is needed to determine impacts to populations. USFWS (2010) concluded the potential competition for forage between pikas and livestock is low and is not considered a significant threat to *O. p. schisticeps* throughout its range. Beever and others (2003) suggest the proximity of roads to suitable pika habitat may increase disturbance, remove or isolate remaining habitat, or inhibit dispersal activity; however, the results of human influence on pikas persistence was established at only 3 of 7 unoccupied sites.

Sequoia National Forest Rationale

There is a 1936 CNDDB record with a location in the Sequoia National Forest plan area, located near Farwell Gap. This is also an NRIS record. Millar and Westfall's study (2010) did not include the Sequoia National Forest. The best available scientific information does not indicate substantial concern about the species' capability to persist over the long-term in the plan area. Based upon the lack of evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Fisher - *Pekania pennanti*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Sufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern:

No, this is a candidate species for listing under the Endangered Species Act

Relevant threats to species:

Loss or degradation of habitat due to uncharacteristic wildfire, vegetation management (e.g., fuels reduction, timber harvest), insect and disease outbreaks, habitat fragmentation, climate change, poisoning from rodenticides, predation, and vehicle strikes.

Rationale for fisher

NatureServe Global Rank: G5

NatureServe T Rank: T2T3Q

State Rank: S2S3

Other Designations: CA-SSC; CA-SGCN; CA-ESA; FS-SS

The fisher has a global rank of G5 and the West Coast Distinct Population (WCDP) has a subspecies global rank of T2T3Q (Imperiled to Vulnerable; Q indicates the taxonomic distinctiveness of this entity at the current level is questionable and resolution may affect the current ranking). The WCDP has a California state rank of S2S3 (Imperiled to Vulnerable) and is designated as a Species of Special Concern and a Species of Greatest Conservation Need by CDFW. The California Fish and Game Commission voted to add the fisher southern Sierra ecologically significant unit (ESU), defined as California south of the Merced River, as a Threatened species under the California Endangered Species Act[8] (, with the notice listed on April 20, 2016[9]. The fisher was petitioned for listing under the federal Endangered Species Act in 1990, 1994, and 2000. Following a series of findings and legal actions, the fisher was identified as a threatened species proposed for federal listing in October 2014 but the proposed rule was withdrawn in April 2016. Subsequent court action vacated the 2016 withdrawal and requires reconsideration of the proposed rule to list the species by September 2019 (CITE 2014, 2016, 2019 FRs). This species is also a Region 5 Forest Service Regional Forester's sensitive species.

Estimates for southern Sierra Nevada are less than500 individuals (Spencer et al. 2011) and the population in northern California through southwest Oregon is estimated at about 3196 (Furnas et al. 2017) individuals.

Fishers are most commonly found in low to mid elevation conifer, mixed conifer, and conifer hardwood forests with dense canopy cover. They are solitary animals, have large home ranges, and require large decadent trees (live and dead) and large downed logs used for denning and resting.

Threats to the persistence of fishers have been identified to include loss or degradation of habitat due to uncharacteristic wildfire, vegetation management (e.g., fuels reduction, timber harvest), insect and disease outbreaks, habitat fragmentation, climate change, poisoning from rodenticides, predation, and vehicle strikes.

Vegetation treatments have been identified as a primary threat to fisher persistence; however, these treatments may prevent more adverse effects associated with drought and wildfire. Vegetation management and prescribed fire that result in the degradation of habitat or loss of key ecosystem components such as dense canopy cover, snags, downed logs, and understory vegetation can result in negative short term impacts to fishers and fisher habitat (Truex and Zielinski 2013, Zielinski et al. 2013a, Sweitzer et al. 2016). (Truex and Zielinski 2013) documented significant negative predicted effects to

[8] http://www.fgc.ca.gov/CESA/Fisher/fisher_findings_part_warranted.pdf
[9] http://www.fgc.ca.gov/CESA/index.aspx#pf

resting habitat suitability from vegetation treatments that included both mechanical and fire activities. The greatest impact to resting habitat suitability was from the reduction in canopy closure. On the other hand, (Truex and Zielinski 2013) found no significant effects of either solely mechanical or solely prescribed fire treatments on predicted resting habitat value, and no effects of any treatment type or combination on predicted foraging habitat.

Zielinski and others (2013a) sampled fisher home range-size areas (14 km2) for fisher scats, using scat detector dogs, and found that the areas with the most abundant scats had an average of 2.6% of their area disturbed per year (equivalent to 13% over a 5-year period) by a combination of vegetation management treatments. The degree of disturbance within sample units varied widely, suggesting fishers may in some circumstances tolerate higher rates of disturbance. In 1 of 5 high-use units and 1 of 3 moderate-use units, ~6.5% of the area was disturbed annually on average (equivalent to ~ 30% over a 5-year period; Zielinski et al. 2013a). Zielinski et al. (2013a) found no statistically significant difference in the mean area of treatment per year across 3 fisher use categories (high, medium, and low), indicating that vegetation disturbance is only 1 of many factors affecting fisher habitat quality.

Sweitzer and others (2016) found local persistence decreased in areas when hazardous fuels reduction treatments or prescribed fire increased. Specifically, annual disturbance and fuels reduction on 3.2% (single season) and 3.7% (multi-season) of an area 1 km2 in size resulted in reduced use by fishers. There was no evidence that timber removal between 2002 and 2013 resulted in reduced occupancy or persistence on the Sierra National Forest (Sweitzer et al. 2016). The author states this was likely due to several factors including: the extent of extraction was much reduced compared to extraction rates from 1860-2000; delay in implementation may have limited their ability to detect an adverse response; estimates of annual disturbance from extraction for single and multi-season surveys were equivalent to levels tolerated by fishers elsewhere on the forest (Zielinski et al. 2013a), thus the low level of extraction did not impinge fisher use of these habitats.

Garner (2013) found that, although fishers avoid using areas treated for fuel reduction (including mechanical thinning and prescribed fire), their home ranges tend to include larger proportions of treated areas than in the landscape as a whole, and they do not shift home ranges in response to treatments. Garner (2013) concluded that treatments do not render the habitat unsuitable and may, in fact, increase fire resiliency, provided management focuses on surface and ladder fuels.

Habitat fragmentation and loss of connectivity between areas of suitable habitat can pose a risk to the persistence of fishers across the landscape. High severity fire, timber harvest, fuels reduction treatments, road presence and construction, and recreational activities may result in the loss of habitat connectivity resulting in a negative impact on fisher distribution and abundance. Key linkage areas important to maintain or create connectivity between larger core areas of fisher habitat across the Sierra Nevada and Cascade Ranges in California have been identified (Spencer and Rustigan-Ramsos 2012). Genetic connectivity for females is associated with dense forest cover and large trees, and is limited by large water bodies and roads, whereas male genetic connectivity has not been found to be limited by these factors and are more likely than females to disperse between core habitat areas through a wider variety of landscape conditions (Tucker et al. 2017).

Recommendations regarding spreading out treatments both spatially and temporally can be in direct contradiction with creating effective fuels treatments that alter fire behavior on the landscape. However, short-term negative localized effects to fisher from active vegetation management designed to reduce high severity wildfire in and near suitable habitat would out-weigh the positive long-term effects of protecting suitable fisher habitat (Spencer et al. 2008).

Loss of habitat from high severity wildfires is considered one of the most significant threats to the persistence of fishers (Spencer et al. 2008, USFWS 2012). High severity wildfires have been increasing over the past several decades and this trend is predicted to continue (Westerling et al. 2006, Miller et al. 2009). Many fires within the current range of the fisher have resulted in the loss of important denning, resting, and foraging habitat. There is no research available regarding fisher use of high severity fire in the first few years after fire. While fisher occupancy was lower in extensively burned forest, they remained present suggesting foraging opportunities remains (Sweitzer et al. 2016). The late seral forested conditions required by fishers could take centuries to return to fire areas that burn at high severity. Wildfire can also result in the loss of connectivity between suitable habitat patches. Maintaining habitat connectivity has been identified as integral in fisher conservation (Spencer et al. 2016).

The potential effects of climate change are complex and not certain. (Solomon et al. 2007) predicted increased risk of extreme weather events such as heat waves, droughts, and floods. Northern California is predicted to have increased winter precipitation and most of California will experience decreased precipitation in the summer months (Lofroth et al. 2010). A warming climate is projected to extend fire seasons and increase total area burned (McKenzie et al. 2004), potentially resulting in direct habitat removal or loss. Less precipitation has resulted in an increase in insect infestations and large scale tree mortality (Taylor and Carroll 2003), resulting in additional loss of habitat and an increased risk of catastrophic wildfire. It is projected that vegetative shifts in response to a warming climate may result in elevational or latitudinal changes in mammal distribution (Kerr and Packer 1998). Potential benefits may include an increase in habitat availability from the predicted reduction in snow pack (Zielinski et al. 2017).

Predation has been documented as the primary cause of mortality of fishers (Lofroth et al. 2010, Sweitzer et al. 2016a). Most likely predators include cougar, bobcat, and coyote (Wengert et al. 2014). Anthropogenic activities, such as vegetation management that removes hiding cover, can contribute to fisher exposure to predation (Lofroth et al. 2010). Roads may also increase the number of lethal interactions between fishers and larger predators.

Rodenticide and insecticide poisoning, most likely in association with illegal marijuana cultivation, has been documented in 85% of fisher carcasses across two project areas in the southern Sierra Nevada and exposure rates to these toxicants has been increasing over time (Gabriel et al. 2012, Thompson et al. 2013, Gabriel et al. 2015). Survival of a female was found to be related to the number of marijuana cultivation sites the animal was likely to encounter (Thompson et al. 2013). Although more research is needed, it is likely that exposure to rodenticides may predispose an animal to dying from other causes. Effects to fisher populations are unknown at this time.

Vehicle strikes are documented as another source of mortality (Sweitzer et al. 2016a) and road density and construction may contribute to this source of mortality. 24 roadkill deaths in the fisher West Coast population segment have been documented between 1992 and 2014. From what is known, vehicle strikes are not a major source of mortality; however, this source of mortality could be underestimated (Sweitzer et al. 2016a).

Forest-Specific Rationale

The majority of the Hume Lake and Western Divide Ranger Districts (approximately one third of the SQF) are in the Giant Sequoia National Monument. The Monument is managed according to direction in the Giant Sequoia National Monument 2012.

Information on current distribution of the species on the planning unit

The Sequoia National Forest is at the southernmost range of the fisher (Greenhorn Mountains and Kern Plateau-Kern County). According to CNNDB there are 56 records for Fisher on the Giant Sequoia National Monument and Sequoia National Forest plan area, with most detections having occurred on the Kern River Ranger District and near the border of the Western Divide Ranger District in Tulare, Fresno, and Kern Counties. In the NRIS database there are 661 occurrences with most records of individuals, although two records had more than two individuals observed together. Only one record (in the year 2000) documented reproduction. The most recent occurrence record was recorded in 2017. No recent den sites are known. Den site buffer management areas occur within the Giant Sequoia National Monument only (J. Cordes pers. comm.), outside the Sequoia National Forest plan area.

The following information on occupancy rates and distribution is excerpted from the draft BE (Krueger 2016), with some minor editing to distinguish occurrence in the Giant Sequoia National Monument versus the Sequoia National Forest plan revision area. Fisher are well distributed on the west-slope from the Kings River south through the Greenhorn Mountains, including the Giant Sequoia National Monument and Sequoia National Forest plan area. Annual rates of occupancy (i.e., proportion of sites sampled that detected fisher) are generally consistent, and the spatial distribution of detections is more consistent from year to year than elsewhere in the southern Sierra. This area has been consistently occupied since surveys began in the early 1990s.

The detection rate of fisher on the Sierra NF is roughly half what it is on the combined Giant Sequoia National Monument and Sequoia National Forest plan area (Zielinski et al 2013). The annual occupancy rate within Sierra NF seems to be consistent, though the spatial pattern of detections appears more variable among years than on the Sequoia National Forest. Mark-recapture data collected over the last several years estimate the density of fisher in the Kings River Project area at approximately 1 per 2,500 acres (Mark Jordan, University of California, pers. comm. 2006).

Long term monitoring results indicate that fishers are well-distributed in portions of the Sequoia and Sierra NFs, with annual proportion of sites occupied consistently higher on the Sequoia than the Sierra as shown in table 11. Despite repeated surveys, fishers have not been detected in the central or eastern Sierra Nevada Mountains and from 2009-2011 fisher were reintroduced to the northern Sierras (Sierra Pacific Land) by California Department of Fish and Wildlife. Comparisons to southern Sierra Nevada survey data from the 1990s suggest that the area of occurrence for fisher may have expanded during the past 20 years (USDA-FS 2005, Tucker et al. 2014). Additionally, analysis of the first seven years of the Region monitoring results found that there has been no conspicuous decline in occupancy rates from 2002-2009; no seasonal effects on detection probabilities within the June to October sampling periods (Truex et al. 2009, Zielinski et al. 2013). Results listing the proportion of monitoring units occupied in the fifteen southern Sierra Nevada monitoring seasons to date (2002 to 2009 and 2011 to 2017).

Table 13. Proportion of fisher sites occupied (naïve occupancy) in the Sequoia and Sierra National Forests* and Giant Sequoia National Monument

Year	Sequoia National Forest West Slope	Sequoia Kern Plateau	Sierra NF	Entire Area
2002	0.35	0.10	0.22	0.25
2003	0.45	0.13	0.17	0.25
2004	0.35	0.23	0.13	0.20
2005	0.41	0.26	0.13	0.24
2006	0.51	0.19	0.19	0.29

Year	Sequoia National Forest West Slope	Sequoia Kern Plateau	Sierra NF	Entire Area
2007	0.52	0.23	0.15	0.27
2008	0.38	0.14	0.19	0.24
2009**	0.51	0.46	0.10	0.25
2011***	0.46	0.27	0.30	0.34
2012	0.50	0.20	0.11	0.23
2013	0.48	0.15	0.18	0.27
2014	0.47	0.44	0.24	0.35
2015	0.52	0.22	0.28	0.33
2016	0.47	0.11	0.12	0.22
2017	0.37	0.20	0.28	0.30

*USDA Forest Service data, Tucker pers. comm. 2018. Geographic areas are defined as Sequoia National Forest West Slope (including Hume Lake Ranger District), Sequoia Kern Plateau (the Kern Plateau portion of Sequoia National Forest), and Sierra (Sierra National Forest). Habitat availability and detection rates on the Kern Plateau may be affected by habitat loss due to large fires. In 2007 the SQF West Slope sampling included one unit in Sequoia National Park, and the Sierra NF included six units in Yosemite National Park.

**Sampling effort during 2009 was reduced on the Kern Plateau due to safety and operational considerations. Sampling was limited to the northern portion of the plateau and the observed occupancy is likely higher than it would otherwise have been if sampling had occurred throughout the area as in previous years (Truex, pers. comm.).

*** Survey protocol was revised in 2011 resulting in a different detection probability for the surveys from 2011-2017 compared to 2002-2009. Numbers reported in this table are not adjusted for detection probabilities.

According to Zielinski et al (2013), the southern Sierra Nevada fisher population does not appear to be expanding its range despite changes in management promoting redevelopment of suitable fisher habitat in the Sierra Nevada (North et al. 2009). In 2017 however, a fisher was detected north of the Merced River in Yosemite National Park for the first time in nearly 100 years (J. Tucker Pers. Comm 2017).

Key ecological conditions for this species

Montane forest consisting of low to mid-elevation conifer, mixed conifer, and conifer hardwood forests with dense canopy cover; large decadent trees (live and dead) and large downed logs (used for denning and resting) are important. Resting and denning sites are the most critical habitat elements.

The Southern Sierra Fisher Conservation Area (SSFCA) encompasses the known occupied range of the fisher in the Sierra Nevada. This consists of an elevation band from 3,500 to 8,000 feet (errata March 2001e) on the Sierra and Sequoia National Forests. This area will be managed to support fisher habitat consistent with the protections California spotted owl. Many of the habitat attributes discussed for the California spotted owl are important to the fisher as well (USDA 2004: p. 7 of ROD).

On the Sequoia National Forest, Western Divide District, mapped female home ranges from the Tule River area were between 3,600 and 7,500 feet in elevation. Males appear to have a much wider range in elevation, 4,000 to 9,300 feet, but also appear to be much less selective in use of habitat in general (Zielinski et al. 2004a). The following California Wildlife Habitat Relationships (CWHR) types are thought to be important to fishers: generally structure classes 4M, 4D, 5M, 5D and 6 (stands with trees 11” diameter at breast height or greater and greater than 40% cover) in ponderosa pine, montane hardwood-conifer, white fir, Sierran-mixed conifer, montane riparian, Jeffrey pine (Macfarlane, 2010) and differ slightly between males and females (Zielinski et al. 2004a).

Most models for fisher indicate that the Kern Plateau is low quality habitat for fisher due to the lower density and more open canopy of the forest in the area. Although consistent detections in the area over the years suggest they may use the more open habitats for foraging and the denser steep, north facing slopes with higher tree density for den sites.

Habitat for Fisher can be largely found in the Montane Zone-mixed conifer and yellow pine (ponderosa and Jeffrey) forest that dominates the montane zone across most of the forest (46 percent of the assessment area). In addition to these species, incense cedar, and white fir are found. Additional habitat can be found in the Upper Montane Zone where snow is the primary form of precipitation. This area occurs above mixed conifer and occupies one-quarter of the assessment area. Red fir forests with Jeffrey pine occur on the rockier sites in the northern half of the forest and in the southern half of the forest, red fir is replaced by white fir.

Potential habitat (excluding private land) available to fisher on the Sequoia National Forest, as defined by the California Wildlife Habitat Relationships (CWHR) is included in the table below (**Error! Reference ource not found.**). Approximately 278,775 acres of forest are classified as having dense cover (60-100 % closure) while 269,532 acres have moderated cover (40-59 %). There are approximately 124,744 acres of forest containing CWHR size classes > 24 inches (Sequoia assessment 2013-chapter 1 snapshot).

Table 14. Acres of potential habitat (excluding private land) available to fisher on the Sequoia National Forest, as defined by the California Wildlife Habitat Relationships (CWHR)

CWHR Habitat Type	Acres
Montane Hardwood-Conifer	39,211
Montane Riparian	5,976
Ponderosa Pine	27,556
Sierran Mixed Conifer	229,423
Jeffrey Pine	50,112
White Fir	2,853
Total	355,131

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Montane Zone

Composition, structure, and fire regimes have changed considerably since pre-settlement times (Van de Water and Safford 2011), and are largely outside the natural range of variability in the Greenhorn Mountains. Pines and oaks have decreased substantially and shade tolerant species, such as cedar and fir, have increased.

Compared to past conditions, forest density is greater, tree canopy is denser, and small and medium trees are more dominant in the forest. Within stand variation in tree size and density has decreased. Drought has triggered tree mortality in mixed conifers; and large tree mortality has doubled in the last 2-3 decades across the western United States. This pattern is associated with increases in temperature and droughts.

Large Trees and Snags

Large tree density varies considerably by forest type. High elevation red fir, lodgepole pine and Jeffrey pine forests have relatively high mean or median densities. Trees greater than 30 inches in diameter are generally four trees per acre or more. The coefficient of variation (COV), a measure of how variable those numbers are is 122 percent. This means that the densities vary radically across the landscape. Although

mean or median levels are moderate in these forest types, the coefficients of variation are often high. Mixed conifer forests have moderate but highly variable densities of trees greater than 30 inch diameter but trees greater than 40 inch diameter are sparse. These forests occur on more productive sites and trees greater than 40 inches in diameter were once more common. In ponderosa pine dominated forests, large trees (diameter greater than 30 inches) are less common and highly variable in occurrence, with mean and median densities of 2.8 and 2.0 trees per acre respectively. Hardwood-conifer and hardwood forests have relatively high densities of trees greater than 21 inch diameter (2 to 18 trees per acre) but the levels are highly variable. Densities of snags greater than 15 inches follow similar patterns by forest type but with levels at least 100 percent lower.

Structural Heterogeneity

Variation in basal area was calculated on the Sequoia National Forest using Forest Inventory and Analysis (FIA) data. Almost all forest plots had had low within-stand variation. Large areas of high severity fire can reduce important forest structures such as large trees with cavities and mature mast-producing hardwoods. Fisher require areas with sufficient overstory and understory cover and uncharacteristically severe wildfire can reduce tree cover, fragment these areas and create barriers to animals traveling across heavily burned areas. These same key habitat elements can be affected by planned management activities (see risk factors below).

The projected status of those ecological conditions relative to the species considered

Fire

According to the recent fire resilience assessment, (Fites-Kaufman et. al. 2007), low and mid-elevation mixed conifer, pine, and foothill areas are mostly low to very low resilience under all weather conditions. Under hotter, drier and windier conditions all the mid and lower elevations have low to very low resilience to fire and would be prone to high severity fire and high levels of tree mortality. On the Kern Plateau, however, Jeffrey pine and eastside mixed conifer forests have variable fire resilience and tend to be drier and more open, with slower rates of fuel accumulation-overall fire resiliency is higher. This greater resiliency may reflect the lower fuel loading, lower moisture stress, and greater use of wildland fire for resource benefit in forest ecosystems on the Kern Plateau.

According to the National Report on Sustainable Forests (USFS 2004), there is a high possibility of increased high intensity fire (resulting from climate change) that could decrease old forest and increase early seral habitat having cascading effects on patch diversity. Expected changes in climate and fire could lead to increased fragmentation of old forest and decreased fragmentation for early seral forest. With the exception of 2017, tree mortality has steadily increased the last several years.

While the current trends do not show a significant increase in the extent of forest change from wildfire on the Sequoia National Forest substantial areas are at a low and very low fire resiliency index as described in Chapter 3 of the assessment, indicating they are susceptible to higher amounts of crown fire than expected.

Insects and Pathogens

The Sequoia National Forest has been experiencing extreme drought and insect related (e.g. bark beetles, fir engravers) mortality and this is expected to continue. Mortality has been consistent across all major conifer with the most dramatic effects on fir species and ponderosa and Jeffrey pine. Statewide trends in 2017 showed that many areas experienced mortality at higher elevations (in the white and red fir) where it had was not been mapped previously, compared to previous years where most of the extensive mortality was observed in lower elevation pine and mixed conifer forests. A broader discussion of tree mortality

related to drought and bark beetle outbreaks, including maps, are provided in the Northern goshawk rationale.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

Habitat relationships of the fisher occurring in the more open forests on the Kern Plateau; the spatial distribution of large trees and snags and location and amounts of complex early seral forest are unknown.

Key risk factors arising from non-ecosystem conditions and/or management activities

Connectivity and Climate Change

On the northern portion of the Sequoia National Forest connectivity of old-forest associated species like fisher is high, but vulnerable to uniform, high intensity fire during more severe weather conditions. Weather conditions conducive to intense fire are already increasing with climate change and are expected to increase more in the near and distant future. This is already happening on the southern portion of the forest, where a number of recent large wildfires (e.g. the Cedar Fire in 2016), combined with widespread tree mortality are creating large barriers to connectivity.

The forest's north-south oriented canyons and mountains across most of the forest allows for northward movement. This will become increasingly important with climate change. At the higher elevations on either side, there is connectivity to areas to the north in wilderness or other specially designated areas such as the Giant Sequoia National Monument. Spencer et al (2016) identified specific fisher linkages which connect core habitat areas on the Kern Plateau to the western portions of the forest and Giant Sequoia National Monument. Approximately 527 square miles were identified as core habitat on the Sequoia National Forest, with 180 square miles of denning habitat. The areas immediately to the north on Sequoia and Kings Canyon National Parks, the Sierra National Forest and the western portion of the Inyo National Forest are unique in the bio-region in having no road that crosses the crest. Wilderness areas on the east side of the Sequoia National Forest connect with this large block. The distribution and connectivity of habitat used by fisher on or near the Kern Plateau may become particularly important in the future with climate change. Currently, there is limited information on fisher habitat use in these types of areas, preventing a specific habitat model for these drier areas (Spencer 2012). In this area, fisher are thought to be more widely distributed but successfully reproducing in a more open forested habitat than typical in the rest of its distribution on the western slopes of the Sierra Nevada. On the Kern Plateau fisher occur at higher elevations than elsewhere in the southern Sierra Nevada which has been attributed to the low annual precipitation and colder temperatures resulting in less fluctuation in snowpack that may increase fisher's ability to use these high elevation areas (Zielinski et al 2017). Climate projections suggest that the Kern Plateau may be at relatively lower climate exposure than other parts of the Sequoia National Forest (Schwartz et al. 2013a). West of the Kern River, there is north-south connectivity adjacent to the Giant Sequoia National Monument. This situation could change as vegetation becomes dense, fuels accumulate and climate warms, and fires increase in frequency and intensity

On the Sequoia National Forest, the California Connectivity Project overlaps with wilderness and inventoried roadless areas. The exception is on the south end of the forest, where a large swath between the foothills and higher elevation was designated as a safe area for moving between habitats. That assessment, however, did not identify more fine scale habitat requirements for fisher.

Fire Suppression

Past suppression policies have led to conditions that can result in large areas of high severity fire that may be detrimental to old forest species such as the fisher or California spotted owl. There is some uncertainty

about the effects of fire severity on these species (Keane 2013 and Zielinski 2013). Modeling has suggested that large, high severity fires have significant, negative impacts on fisher habitat quality and population size (Scheller et al. 2011, Thompson et al. 2011). Spencer et al. (2015) note that high severity fires over large areas pose a significant risk to the fisher population by reducing and fragmenting habitat, and that mixed-severity fires will be beneficial.

Timber

The Sequoia National Forest essentially abandoned even-aged reforestation management 20 years ago, in favor of stand maintenance thinning harvests intended to control density and growth of stands, generally for habitat maintenance. Thinning reduces the number of trees on a site, allowing remaining trees to increase crown and photosynthetic production, and increases growth rates on those remaining trees.

There are over 20,000 acres of plantations on the Sequoia National Forest in need of treatment that would allow the stands to develop old forest conditions. The treatments are needed to reduce fuel loading, reduce inter-tree competition, and improve the species mix within the stands. While these plantations contain some saw log size material, the majority of the trees are only suited for biomass. There are few projects that provide adequate volume to potential markets to make the projects commercially viable. This limits the forest's ability to keep up with the pace and scale necessary to realize restoration benefits.

Recent studies have documented a significant threat to fisher from rodenticide poisons commonly used in illegal marijuana plantations, with males being more affected than females. (Gabriel 2012, 2015). A large proportion of fisher carcasses recovered between 2007 and 2011 in the southern Sierra research sites showed evidence of exposure to one or more rodenticides (Thompson et al. 2011). More than 300 illegal marijuana sites have been located in these research areas since 2002 and this is a likely risk factor for fisher on the Sequoia National Forest.

Sequoia National Forest's transportation system has developed and evolved over the past 100 years, with many roads and trails created by users during the 1900s. Since vegetation management has declined substantially since the early 1990s, public use of forest roads has grown steadily, and driving for pleasure is the single largest recreation use of Forest Service managed lands. The Sequoia National Forest currently manages and maintains a National Forest Transportation System which consists of approximately 1,646 miles of system roads, 370 miles of motorized system trails, and 687 miles of non-motorized system trails. Within the Sequoia National Forest 346,611 acres or 29% of the forest remain as inventoried roadless area. Of the initial inventoried roadless areas, 137,697 acres have been designated as wilderness, however, these areas occur at high elevation where suitable fisher habitat is lacking. The majority of FS roads are at lower elevations and co-occur with fisher habitat. Fisher mortality resulting from vehicle collisions has occurred on the Hume Lake RD in areas where vehicles can maintain higher speeds. See above discussion on connectivity for additional information.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Fisher occupancy rates on the Sequoia National Forest appear stable, but risk factors are numerous, and fishers occupy less than fifty percent of their historic range and are subject to exposure to high levels of environmental toxicants resulting in both lethal and sub lethal effects. Large stand replacing wildfire is likely to increase in frequency and intensity, as result of historic fire suppression coupled with the effects of increased drying and changing climate conditions. Bark beetle outbreaks add additional stress to the mixed conifer system. This type of disturbance puts fisher, who are habitat specialists, at future risk of loss of key forest structures (such as large trees with cavities and mature mast-producing hardwoods), forest canopy, and increased fragmentation. For all these reasons, there is substantial concern about this

species' ability to persist on the planning unit. However, based upon the evidence and supporting best available science, Fisher does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area since is it a candidate for listing under the Endangered Species Act.

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Pallid bat - *Antrozous pallidus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species

Reduction in available roost sites through the removal of conifer and hardwood trees (dead and dying) during timber harvest or fires. Sensitivity to disturbance at roost sites.

Rationale for pallid bat

The pallid bat has a global rank of G4 (Apparently Secure) and a California State rank of S3 (Vulnerable). The pallid bat is currently a Region 5 Forest Service sensitive species and is recognized as a Species of Special Concern and a Species of Greatest Conservation Need by CDFW. This species has been assigned a High Priority designation by the Western Bat Working Group (2016), indicating this species should be considered one of the highest priority for funding, planning, and conservation actions as it is considered imperiled or are at high risk of imperilment. The pallid bat is also a Region 5 Forest Service Sensitive species.

Population size is unknown; however, pallid bats are thought to be well distributed throughout California. Short and long-term population trends are considered either stable or slightly declining to an uncertain degree (NatureServe 2017). In urban areas, including Santa Clara and San Diego Counties where urbanization and land conversion have occurred, there is evidence of population declines (Johnston and Stokes 2007 *in* CBWG 2016).

Pallid bats use a wide range of habitats including desert scrub, grassland, oak woodland, and mixed hardwood and coniferous forest (Baker et al. 2008). They are gregarious, roosting in small to large groups, using many different types of roosts including rock crevices, trees basal hollows and cavities, buildings, bridges, and occasionally caves and mines (Barbour and Davis 1969b, Hermanson and O'Shea 1983, Rabe et al. 1998, Baker et al. 2008). Pallid bats use both live and dead trees, roosting in cavities, basal hollows, under loose bark, and even an underground root cavity, (Orr 1954, Rainey et al. 1992, Lewis 1994, Pierson et al. 1996, Rabe et al. 1998, Johnston and Gworek 2006, Baker et al. 2008). They use a variety of tree species for roost sites including oaks, cedar, pine, and even giant sequoia. Similar to roosting, pallid bats forage in a variety of habitat types including open grassland, oak woodland, in forested areas with open understories (Hermanson and O'Shea 1983), and even logging roads (Baker et al. 2008).

The greatest threats to the persistence of pallid bats are those most closely associated with the Central Valley and urban areas, not National Forest System lands. Threats include habitat conversion to agriculture, destruction, removal, restoration/retrofitting, or exclusion from anthropogenic roost sites including buildings and bridges, and to a lesser extent, urban development or forest management resulting in the removal of large hardwood and conifer trees (CBWG 2016). Urban threats including habitat conversion and loss of available bridge and building roost sites are not considered limiting factors to pallid bat persistence within the plan area. Removal of large snags and damaged trees ≥ 61 cm dbh (26 inches) during timber harvest or fires may result in a reduction of roost site availability on National Forest System lands (Rabe et al. 1998, Baker et al. 2008). Because pallid bats are eclectic in their use of a wide variety of roosting structures, the potential loss of some tree roosting sites are not considered a limiting factor within the plan area

White-nose syndrome (a cold-loving fungus that afflicts bats hibernating in caves and mines) is a potential threat that has not yet been detected in California. Pallid bats are not known to be affected by white-nose syndrome (USFWS 2014). Pallid bats have been documented to use caves and mines for

roosting (Hermanson and O'Shea 1983, van Zyll de Jong 1985). Pallid bats are more often documented using other structures for roosting sites such as trees, rock crevices, and bridges (Hermanson and O'Shea 1983). Based on what is known, white-nose syndrome is not considered a limiting factor for pallid bats in the plan area.

Sequoia National Forest-specific Rationale

Found in limestone and dolomite formations in the Sierra Nevada. There are no records for pallid bat in the NRIS database or CNDDB located on the Sequoia NF plan area. The greatest threats to the persistence of pallid bats are those most closely associated with the Central Valley and urban areas, not National Forest System lands. Since they use a wide diversity of roosting structures, threats to tree roosting sites are not considered a limiting factor within the plan area. There is insufficient information to demonstrate substantial concern for long-term persistence in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Western small-footed myotis - *Myotis ciliolabrum*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

There are no major threats throughout the species' range. Potential threats to bats include habitat loss and non-native disease (e.g., white-nose fungus). Other factors that may affect bats include altered fire regimes, climate change, and pollutants.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: None

State Rank: S3

Other Designations: None

Western small-footed bats are found across much of the western half of North America, from southern British Columbia and Saskatchewan in the north down to Baja California, Zacatecas, and Nuevo León in the south. They are most common in arid and semiarid habitats, such as deserts, but may be found in pine or juniper forests, and more mesic habitats are used in the southern part of the range (Halloway and Barclay 2001). They are found from 300 to 3,300 m (980 to 10,830 ft). Two subspecies are recognised:

In California, small-footed myotis occurs in coastal areas from Contra Costa Co. south to the Mexican border, and on the west and east sides of the Sierra Nevada, and in Great Basin and desert habitats from Modoc to Kern and San Bernardino Counties. It occurs in a wide variety of habitats, primarily in relatively arid wooded and brushy uplands near water. The summer and winter ranges appear to coincide, but there are few records from winter. This species is found from sea level to at least 2700 m (8900 ft). Individuals are known to roost singly or in small groups in cliff and rock crevices, buildings, concrete overpasses, caves, and mines. There is no Sierra Nevada trend information available for this species.

Sequoia National Forest-specific Rationale

There are two CNDDB records on the Sequoia National Forest, from 1993 and 2003, located in Lower Kern River Canyon. The best available scientific information does not indicate substantial concern about the species' capability to persist over the long-term in the plan area. Based upon the lack of evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

NatureServe. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Yellow-eared pocket mouse - *Perognathus parvus xanthonotus*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Unknown

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T2

State Rank: S1S2

Other Designations: CA-SGCN

Yellow-eared pocket mouse has a ranking of G5/T2 in NatureServe and a California state rank of S1S2 (imperiled) and is California Species of Greater Conservation Need. According to CNNDB records there have been 4 different survey efforts in the early 1900s through late 1970s that documented occurrences of yellow-eared pocket mouse in Kern County on the Kern River RD just south and southeast of the Scodie Mountains (Walker Pass, Freeman Canyon, Horse Canyon, Sage Canyon). Much of this area crosses onto BLM lands. There are eleven occurrences recorded during those surveys. There are no recent records of this species in the NRIS database, however there have been no recent small mammal surveys conducted on the forest. In the BISON database, specimens were collected in the early 1900s east of the Scodie Mountains and Sequoia National Forest boundary (along Walker pass Road). Twenty-four specimens were collected south of the Scodie Mountains in 1974, within the boundary of the Sequoia National Forest. In the planning area, the yellow-eared pocket mouse has only been detected on Sequoia National Forest in Kiava Wilderness.

Yellow-eared pocket mouse is supported by habitats like desert scrub, pinyon-juniper, chaparral, and sagebrush habitats with sandy soils and sparse to moderate shrub cover (4,000-5,000 ft). There is little

information regarding the ecology of the yellow-eared pocket mouse, but it is expected to be similar to the closely related Great Basin pocket mouse, P. *parvus.*

There are no current records for this species on the forest and existing survey data for this species is over 40 years old. Additional surveys are necessary to determine its current distribution. In addition, the ecological conditions for this species are not well understood. There is insufficient information to demonstrate substantial concern for long-term persistence in the plan area. Based upon the evidence and supporting best available science, Yellow-eared pocket mouse does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

USDA 2016. Draft Environmental Impact Statement for Revision of the Inyo, Sequoia, and Sierra National Forests Land Management Plans. Volume 1: Chapters 1 through 4, Glossary, References, and Index. Pacific Northwest Region. 740 pp.

United States Department of Interior, Bureau of Land Management (USDI BLM). 1998. Yellow-eared pocket mouse, *Perognathus xanthonotus*. Species Account prepared by David Laabs in support of the West Mojave Plan EIS/EIR, Accessed at: https://www.blm.gov/ca/pdfs/cdd_pdfs/yellowpktm1.PDF

Amphibian

Greenhorn Mountains slender salamander - *Batrachoseps altasierrae*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Potential for degradation or loss of habitat due to ground disturbance, fire suppression equipment and road maintenance.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: S3S4

Other Designations: None

See the description of members of the genus *Batrachoseps*, known as the slender salamanders or "worm salamanders" in the Fairview slender salamander rationale.

Batrachoseps altasierrae is endemic and restricted to higher elevations in the southern Sierra Nevada, from the higher elevations on the northern side of the Lower Kern River Canyon (Greenhorn Mountains) to the Tule River drainage and upper elevations of the Little Kern River drainage in Kern and Tulare counties. All populations occur in the Giant Sequoia National Monument and the Sequoia National Forest plan area. The elevational range is 900–2440 m. Most populations are found in coniferous forest containing a mixture of pine, fir and incense cedar.

Batrachoseps altasierrae is a recently described species (Jockusch et al. 2012) that had previously been included in *B. relictus*. Unlike *B. relictus*, *B. altasierrae* is not listed as a species of special concern by the State of California and is not a Regional Foresters sensitive species by the U.S. Forest Service. Jockusch et al. (2012) considered populations of *B. altasierrae* healthy, both in the Greenhorn Mountains and within the Tule River drainage, with individuals found in large numbers during appropriate conditions. There are 43 known populations documented in CNDDB, with the majority occurring in the Giant Sequoia National Monument. There are about 10 occurrences in plan area, most in the Greenhorn Mountains and one on Kern Plateau. Based upon the evidence and supporting best available science, the Greenhorn Mountain slender salamander does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2018. Special animals list. Periodic publication. 51 pp.

Jockusch, E.L., Martinez-Solano, I., Hansen, R.W., and Wake, D.B. 2012. Morphological and molecular diversification of slender salamanders (Caudata: Plethodontidae: Batrachoseps) in the southern Sierra Nevada of California with descriptions of two new species. Zootaxa 3190: 1-30.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Gregarious slender salamander - *Batrachoseps gregarius*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Potential for degradation or loss of habitat due to ground disturbance, fire suppression equipment and road maintenance.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

The gregarious slender salamander is endemic to California and occurs along the west slope of the central and southern Sierra Nevada Mountains from the southern boundary of Yosemite National Park almost to the Kern River (Jockusch, Wake & Yanev 1998). The species range does include the Sequoia National Forest plan area.

See the description of members of the genus *Batrachoseps*, known as the slender salamanders or "worm salamanders" in the Fairview slender salamander rationale.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

Gregarious slender salamanders have the widest range of any of the slender salamanders, occurring in Mariposa, Fresno, Tulare and Kern Counties. In Tulare County, they are found in Kaweah and Tule Rivers and Arrastre Creek. On the Sequoia National Forest plan area, gregarious salamander occurs in the Greenhorn Mountains, and in areas to the east and north (Jockusch et al. 2012). There are CNDDB records for this species on the Giant Sequoia National Monument but no records from the plan area.

Key ecological conditions for this species

Key ecological conditions for the gregarious slender salamander include oak woodlands, riparian corridors, forest litter, rocks, down logs and woody debris.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Terrestrial ecosystems are diverse on the Sequoia National Forest. There are changes with elevation, and north to south and east to west. Floristically, the High Sierra Nevada, Central Valley, Southern California Mountains, Great Basin Desert, and Mojave Desert are all represented. The forest can be roughly divided into three distinct ecological environments: the Greenhorn Mountains, the Kern Plateau, and the Breckenridge, Piute, and Scodie Mountains. At a finer scale, the forest is represented by ecological zones.

The integrity of these ecosystems or ecological zones have been especially impacted by historic management such as surface mining, road locations, timber harvest and intensive grazing during the 1800s and early 1900s. Fire suppression has impacted riparian habitat by increasing conifer density and decreasing riparian hardwood and herbaceous vegetation. Fire suppression associated with past vegetation management has also led to increased forest density and fuel loads across the forest. Consequently, fires are more intense and uniformly severe, and forests are more vulnerable to insect and pathogen outbreaks and drought-related tree mortality (USDA 2013).

The projected status of those ecological conditions relative to the species considered

Surface mining, and timber harvest have decreased substantially over the past 20 years, and as a result, ground disturbance from these activities as also decreased. The potential for fire on the landscape is high. As fire severity and intervals increase, degradation and loss of habitat for this species may increase. Climate change with warmer temperatures, along with more rain than snow are expected. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. Invasive plant species are also expected to increase, especially in the surrounding foothills. Once an invasive species dominates a site, fire patterns are expected to change and become more frequent. Land management activities that degrade or remove ground cover or forest litter can also further impact this species.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

For the more terrestrial salamander species, ground-based disturbance from a variety of sources could directly impact individuals on the surface or under rocks, logs or forest litter. This species is most threatened by degradation or loss of habitat. Ground disturbance that alters or removes ground cover, including woody debris and forest litter can directly impact this species. Additional threats to this species include disease and natural predators. *Batrachochytrium dendrobatidis* has been documented for the California slender salamander (*Batrachoseps attenuatus*), however, chytridiomycosis impacts on this species is unknown. Natural predators of this species likely include spotted and striped skunks, ringtails, raccoons, gray foxes, ring-necked snakes, and various skinks, moles and shrews (Krueger 2016). This species is also vulnerable to stochastic events such as fire or climate change. Large scale fire can directly eliminate individuals and localized populations if the severity is high enough to remove forest litter and woody debris.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Gregarious slender salamanders have the widest range of any of the slender salamanders in the southern Sierra Nevada and uses habitats and elevation range with fewer threats than the other species. In the plan area, *Batrachoseps gregarius* occurs in Greenhorn Mountains and to the east and north. There are potential threats but no known threats to persistence in the plan area. Based upon the evidence and supporting best available science, the gregarious slender salamander does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded January 2018.

Cordes, Jeff. 2018. District Wildlife Biologist, Sequoia National Forest. Personal communications with Jeff Cordes. Email dated January 19, 2018.

Jockusch, E. L., D. B. Wake, and K. P. Yanev. 1998. "New species of slender salamanders, Batrachoseps (Amphibia: Plethodontidae), from the Sierra Nevada of California." Contributions in Science, Natural History Museum of Los Angeles County, #472 1998.

Jockusch, E.L. and D.B. Wake. 2002. Falling apart and merging: diversification of slender salamanders (Plethodontidae: Batrachoseps). Biolog. J. Linnean Soc. 76:361-391.

Jockusch, E.L., Martinez-Solano, I., Hansen, R.W., and Wake, D.B. 2012. Morphological and molecular diversification of slender salamanders (Caudata: Plethodontidae: Batrachoseps) in the southern Sierra Nevada of California with descriptions of two new species. Zootaxa 3190: 1-30.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

USDA 2013. Final Sequoia National Forest Assessment. Document Number: R5-MB-267. Vallejo, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Region. 266 pp.

USDA 2016. Draft Environmental Impact Statement for Revision of the Inyo, Sequoia, and Sierra National Forests Land Management Plans. Volume 1: Chapters 1 through 4, Glossary, References, and Index. Pacific Northwest Region. 740 pp.

Kings River slender salamander – *Batrachoseps regius*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Ground disturbance to microsite conditions, degradation or loss of habitat due to ground disturbance or fire. Water quantity and quality, including stream morphology and temperatures.

Rationale for Species

NatureServe Global Rank: G2

NatureServe T Rank: None

State Rank: S2S3

Other Designations: FS-SS

See the description of members of the genus *Batrachoseps*, known as the slender salamanders or "worm salamanders" in the Fairview slender salamander rationale.

The Kings River slender salamander is endemic to California. This species is found in a small local region, located on the western slopes of the Sierra Nevada in Fresno County on the south and east sides of the North Fork of the Kings River, and from Summit Meadow in the drainage of the South Fork of the Kings River. It is also found on the middle fork of the Kaweah River drainage in Tulare County

(Jockusch, Wake & Yanev 1998). In this area, Kings River slender salamanders are found along streams and moist canyons, in valley foothill riparian habitat, blue oak woodland and mixed conifer woodland (Kucera 2005). This type habitat for this species is well-shaded, mixed chaparral on north-facing slopes.

This species has no known occurrences within the Sequoia National Forest plan area; it is restricted to the Kings River area on the Giant Sequoia National Monument, which is not included in the plan area. CNDDB records exist for this species on the Giant Sequoia National Monument and are restricted to the Kings River area. Based upon the evidence and supporting best available science, Kings River slender salamander does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

CaliforniaHerps.com. 2018. A Guide to the Amphibians and Reptiles of California: Kings River Slender Salamander - Batrachoseps regius. Available at: http://www.californiaherps.com/salamanders/pages/b.regius.html

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded January 2018.

Jockusch, E. L., D. B. Wake, and K. P. Yanev. 1998. New species of slender salamanders, Batrachoseps (Amphibia: Plethodontidae), from the Sierra Nevada of California." Contributions in Science, Natural History Museum of Los Angeles County, #472 1998.

Kucera, T. 1997. Relictual Slender Salamander Batrachoseps relictus. In: California's Wildlife. Vol. I. Amphibians and Reptiles. D. C. Zeiner, W. F. Laudenslayer Jr., K. E. Mayer, and M. White. California Department of Fish and Game, Sacramento, California.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

USDA 2013. Final Sequoia National Forest Assessment. Document Number: R5-MB-267. Vallejo, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Region. 266 pp.

USDA 2016. Draft Environmental Impact Statement for Revision of the Inyo, Sequoia, and Sierra National Forests Land Management Plans. Volume 1: Chapters 1 through 4, Glossary, References, and Index. Pacific Northwest Region. 740 pp.

Fish

Kern brook lamprey - *Entosphenus hubbsi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? Yes

Proposed Species of Conservation Concern
No

Relevant Threats to Species
Fragmented watershed conditions due to dams, altered flow regimes and temperatures in streams and rivers for hydroelectric power, agriculture and mining activities; changes in water quantity or quality; habitat loss, competition and predation from invasive species, drought and climate change.

Rationale for Species
NatureServe Global Rank: G1G2

NatureServe T Rank: None

State Rank: S1S2

Other Designations: FS-SS; SSC; SGCN

The Kern brook lamprey was originally described in the genus *Entosphenus*. The taxonomic status of the genus *Lampetra* is under debate (see Vladykov and Kott 1976); Robins et al. (1991) retained *Lampetra* as the genus and regarded *Entosphenus* as a subgenus. Apparently, *L. hubbsi* was derived from parasitic *L. tridentata* (Lee et al. 1980). Other nonparasitic species in this genus occur in south central California and in the Pit and Klamath River drainages in northern California. *L. hubbsi* apparently is distinctive from all others (Starnes 1995). See Moyle et al. (1989) for comparative morphological data on California *Lampetra*.

Moyle (2002) indicated that the principle habitats of the Kern brook lamprey are silty backwaters of rivers emerging from the Sierra foothills (mean elevation of 135 meters with a range from 30 to 327 meters). Ammocoetes are usually found in shallow pools and along edges of runs where water velocity is low. Ammocoetes favor substrates that are a mixture of sand and mud ranging in depth from 30 to 110 centimeters, where summer temperatures rarely exceed 25 degrees Celsius (Brown and Moyle 1993). This habitat also characterizes the lightless siphons of the Friant-Kern Canal, where ammocoetes are abundant at times. Presumably, siphon populations do not contribute to the survival of the species, because adults derived from them would wind up in the aqueduct itself. Adults in natural environments seek riffles with gravel for spawning and rubble for cover. Based on the times at which adults are collected, Kern brook lampreys undergo metamorphosis in fall and spawn in spring. Other aspects of its life history are not known, but are presumed to be similar to those of the western brook lamprey.

The Kern brook lamprey (Vladykov and Follett 1976) is endemic to the east side of the San Joaquin Valley, California, with only six known populations that are isolated from one another; five are in short reaches below dams, so their persistence depends on dam operations and maintenance of suitable habitats for ammocoetes. Locations include lower reaches of the Merced, Kaweah, Kings, and San Joaquin Rivers (Moyle et al. 1989, Moyle 2002); and the Friant-Kern Canal, east of Delano, Kern County, California, which apparently provides ammocoete habitat but not spawning habitat. Lampreys with low numbers of trunk myomeres (i.e. mussel subunits) reported from the upper San Joaquin River between Millerton Reservoir and Kerckhoff Dam, as well as those collected in the Kings River above Pine Flat Dam (Fresno County), may also be *L. hubbsi* (Moyle et al. 1989, Moyle 2002). Apparently the species is thinly distributed throughout the San Joaquin drainage, with populations isolated from one another, at elevations of 30 to 327 meters (Moyle et al. 1989, Moyle 2002). The California Fish Website (http://calfish.ucdavis.edu/species/?uid=39&ds=241) lists 8 watersheds for this species: Middle San

Joaquin-Lower Chowchilla Watershed, Middle San Joaquin-Lower Merced-Lower Stanislaus Watershed, Mill Watershed, Tulare-Buena Vista Lakes Watershed, Upper Dry Watershed, Upper Kaweah Watershed, Upper King Watershed, and Upper Merced Watershed.

Moyle (2002) rated Kern brook lamprey as 2.0 (vulnerable) which means “sufficiently threatened to be on a trajectory toward extinction if present trends continue and of special concern; the species is in decline, so species management is needed to keep it from becoming threatened or endangered."

Moyle also specified that relatively few unequivocal collections of this species have been made since it was first discovered in 1976. This is because most collections are ammocoetes that cannot be reliably distinguished from those of western brook lamprey, a more broadly distributed species. Probable populations are thinly scattered throughout the San Joaquin drainage and isolated from one another (Brown and Moyle 1993). This fragmented distribution makes local extirpations likely, without the potential for recolonization, followed by eventual extinction. The probability of local extirpation is increased because all known populations but one are below dams, where regulated discharges result in fluctuations or sudden drops in flows that may strand or desiccate ammocoetes.

Although existing data are sparse, Nawa (2003) noted that each of the four species of lamprey from the west coast of North America (Pacific lamprey, river lamprey, western brook lamprey, and Kern brook lamprey) is likely to become extinct or endangered with extinction in the foreseeable future throughout all or parts of their range in the coterminous United States.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

There are no positive identification records for this species on the Sequoia National Forest. Locations do exist on the Giant Sequoia National Monument.

Key ecological conditions for this species

Key ecological conditions for this species include cool lowland waters, clear streams and silty backwaters of large rivers.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Stream morphology and temperatures may be affected by hydroelectric use in the Sierra Nevada Mountains. Dams and diversions may contribute to aquatic habitat alteration by blocking aquatic species movement or migration, and may contribute to species isolation. Water temperatures downstream of dams are affected by volume of flow and temperature of the upstream reservoir. Warming temperatures can further limit distributions of native fishes, other aquatic dependent species and the Kern Brook lamprey as well (USDA 2013, Santos et al. 2014).

Fish stocking in rivers, streams, reservoirs, and previously fishless lakes have reduced native fish and amphibians, for example yellow-legged frogs. Other aquatic invasive species, such as quagga mussel and New Zealand mudsnails, have spread throughout California on boats, fishing equipment, and other water sports gear (Moyle et al. 2015).

The projected status of those ecological conditions relative to the species considered

Four hydroelectric projects are located on the Kern River. These hydroelectric projects are run off of the rivers, and do not influence timing of flows of the rivers. Outside the forest, Pine Flat Reservoir

eliminates connectivity of habitat for native cool water species, Lake Isabella, is on the forest but not managed by the forest, was built on top of previous habitat for this species, blocks connectivity , and have introduced non-natives into the river systems (USDA 2013).

Existing conditions of habitat for this species has been influenced by a variety of drivers. Among the findings from the Sierra Nevada Ecosystem Project (SNEP 1996) was that the aquatic/riparian systems were the most altered and impaired habitats of the Sierra Nevada (USDA 2013). There findings were based on the following (USDA 2013):

- Effects to stream flow (through dams and diversions altering stream flow patterns and water temperatures);
- Loss of connectivity for lower elevation natives such as hard head minnows.
- Effects to riparian areas damaged by grazing and locally by dams, ditches, flumes, pipelines, roads, past timber harvest, and recreational activities;
- Water quality impacts (increased temperatures where riparian vegetation is lacking or where deep pools are lacking) and increased water temperatures in the reservoir releases when low through flow occurs (summer and drought years).

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Activities that reduce water flow may impact this species. In addition, limited dispersal ability of this species and fragmented populations due to dams put it at further risk for localized extinctions. Non-native fishes have been introduced or have invaded most waters of the range. These waters include extensive areas that were once fishless at high elevations. Sierra Nevada fisheries have largely shifted from native fishes, especially salmon and other migratory fishes, to introduced fishes (USDA 2013). Predation by non-native, introduced fishes is a major threat to this species. Smallmouth bass (*Micropterus dolomieu*) may readily consume juvenile Kern brook lamprey. Additionally, predation from introduced American bullfrogs (*Rana catesbiana*) likely impact this species (Moyle et al. 2015).

Other risk factors include:

Channelization and Destruction of Riparian Vegetation - Lamprey species depend on muddy bottoms, backwater areas, and low gradient areas during their larval life stage. Lampreys are greatly affected by loss of wetlands, side channels, back eddies, and beaver ponds (PSMFC 1997). Channelization, floodplain filling, and destruction of riparian vegetation is widespread in low-gradient stream areas favored by lamprey for spawning and rearing. River channelization negatively impacts larval lamprey habitat by increasing stream velocity, thereby reducing depositional areas favored by larval lamprey (Close et al. 2002). High stream temperatures resulting from the destruction of riparian vegetation are a likely limiting factor because lampreys prefer temperatures below 20 degrees Celsius (BioAnalysts 2000).

Chemical and Organic Waste Poisoning - Bridge crossings, roads, and irrigation ditches make eradication from accidental spills or intentional chemical treatment a high-risk threat. Lampreys are particularly vulnerable to chemical spills because populations in a basin may concentrate in one stream (Kostow 2002, Nawa 2003). Since lamprey ammocoetes take up to six years before metamorphosing, six years of production are lost during a chemical poisoning.

Dredging - Kostow (2002) reports that most lamprey die after passing through dredges. Suction dredging for gold would also likely kill developing eggs and ammocoetes (Nawa 2003).

Recreation Use – Recreation use on the Sierra NF may also pose a risk to the Kern brook lamprey and its habitat. Most areas that are accessible to camping or off-road vehicles and other use may affect ammocoetes habitat or disrupt spawning (Santos et al. 2014). Water plays a major role in providing a diverse set of recreation opportunities on the Sierra NF. The San Joaquin River and other areas where habitat exists may be at risk as recreational use increases (USDA 2013).

Road Culverts - Similar to dams, culverts that pass adult salmonids are often barriers to lamprey. A systematic survey of lamprey in the Alsea Basin, Oregon found lampreys were often absent above road culverts (Kostow 2002).

Water Diversions - Stream diversions can kill juvenile and adult lamprey by stranding due to artificial lowering of the water level, or because the diversions are unscreened or the lamprey can get under or through the screens (Kostow 2002; BioAnalysts 2000).

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The abundance and distribution of the Kern brook lamprey is relatively well documented, and evidence suggests that they are much less abundant than they were historically. Their distribution is also fragmented, with largely isolated populations scattered among several River systems and throughtout the range. No records exist for this species on the Sequoia National Forest.

The biggest threats to this species are the loss of connectivity and water quality and quantity due to hydroelectric use. These factors combined with direct mortality due to predation, recreation use, along with stochastic events and climate change that affect water temperatures, put the Kern brook lamprey at significant risk where isolated populations exist.

Since no records exist for this species on the Forest, *there is insufficient information to demonstrate substantial concern for long-term persistence in the plan area.* Based upon the evidence and supporting best available science, Kern brook lamprey does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Reptile

Western pond turtle, Actinemys [=Emys] marmorata

Type of Animal: Reptile

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about species capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern:

No

Relevant threats to species:

Land use changes, habitat degradation and fragmentation, recreational activities that interrupt feeding and basking, high densities of non-native competitors or native predators, and climate change.

Rationale for Western pond turtle:

The western pond turtle (*Actinemys marmorata*) is considered Vulnerable by the IUCN. According to NatureServe, the global ranking is Vulnerable-Apparently Secure (G3G4), with the following state rankings: Critically Imperiled in Washington (S1), Imperiled in Oregon (S2), and Vulnerable in California and Nevada (S3). The turtle is listed as Endangered in Washington, and carries the designation of State Sensitive-Critical in Oregon, Species of Conservation Priority in Nevada, and Species of Special Concern by the California Department of Fish and Wildlife. In California, the western pond turtle also carries the designation of Species of Greatest Conservation Concern. The turtle was petitioned for listing under the Endangered Species Act in 1998 and, again, in 2012. The 2012 petition has resulted in the U.S. Fish and Wildlife Service conducting a formal status review; currently, the results are pending. The species has notably declined in California in the Central Valley, San Francisco Bay area, and southern parts of its range, primarily due to habitat loss and degradation and predation by non-native or native predators (Bury et al. 2012). Declines have also been recorded in the extreme northern portion of the species range in Washington (Hallock et al. 2017), due to disease, and in the Willamette Valley of Oregon where land use changes are increasingly occurring (Rosenberg et al. 2009). In Oregon, the turtle remains abundant south of Salem with large populations in the Klamath Basin and a current distribution similar to the presumed historic distribution (Rosenberg et al. 2009). In California, western pond turtles are still broadly distributed; frequently abundant in the middle and northern portions of its historic range, and likely common on private lands where few surveys occur (Bury et al. 2012, Germano and Riedle 2015). California, Oregon, and Washington have implemented programs to captively rear eggs (referred to as headstarting) to increase survivorship during the vulnerable early years with the assumed benefit of increasing population sizes (Rosenberg et al. 2009, Hallock et al. 2017).

Western pond turtles are relatively long-lived with some turtles reaching 50 years or more in the wild (Bury et al. 2012). There are several difficulties in making inferences about population persistence because adult turtles may persist many years after a population has collapsed below the threshold of viability, there is low detection probability in many habitats, and hatchlings and young turtles are difficult to observe and count. Also, there have been very few long-term studies of population dynamics for any given population (Bury et al. 2012). For these reasons, it is difficult to quantify population numbers and trends for this long-lived species. Several researchers have noted apparently high survival and stable

populations in both high elevation (Bury et al. 2010, Germano and Riedle 2015) and low elevation habitats (Germano 2016), even in highly altered conditions (Germano 2010). Other information indicates recruitment of young turtles may be occurring at relatively high rates (Cook and Martini-Lamb 2004, Germano and Bury 2009, Bury et al. 2010, Ashton et al. 2015, Germano and Riedle 2015, Germano 2016); but, due to limitations of certain survey techniques that do not attempt to capture the ages of individual turtles (i.e., visual surveys of basking turtles), reproductive success and recruitment is often underestimated and interpreted as populations skewed to adults (Holland 1994, Jennings and Hayes 1994).

Historically, low elevation wetland habitats such as the Great Central Valley were the core range for the western pond turtle in California (Bury et al. 2012). The vast majority of these low elevation wetland habitats has been urbanized or converted to agriculture and the current stronghold for the species has seemingly moved up in elevation and latitude (D. Ashton, pers. comm.). In the Sierran foothills, available habitats for western pond turtles may have increased due to the construction of artificial ponds, primarily used for watering livestock (Germano and Riedle 2015). While many populations occur on lands administered by the federal agencies (e.g. Forest Service, National Park Service, and Bureau of Land Management), these populations occur at the historical edges of their range and very little is known about population sizes or demographics. In general, edge populations tend to be more vulnerable to threats than core populations because the animals already experience baseline physiological stress due to natural environmental conditions. The lower elevation flowing waters on lands administered by the Forest Service are frequently intermittent (smaller streams) or modified by dams (larger streams and rivers). The western pond turtle commonly occurs in smaller foothill and mountain streams that may have intermittent flow (Ruso et al. 2017). These habitats may present environmental conditions that reduce body size and condition and increase time in terrestrial environments (Bondi and Marks 2013). Reduced body size and fitness may influence overall reproductive output over a lifetime, and increased time in terrestrial environments, especially during summer estivation, may expose individuals to a greater predation or wildfire risk. Habitat fragmentation is an important consideration when attempting to manage habitats for the western pond turtle (Bruce Bury, pers. comm.). Local turtle populations may be fragmented along a single river by factors such as large reservoirs (e.g., New Melones, Lake Isabella, and Folsom) or by distance if occupied patches are separated by a distance greater than the dispersal capabilities of the species.

Additional potential stressors in the plan area include forest management activities that directly disturb terrestrial nest or over-wintering sites; roads and the associated vehicle traffic that bisect core aquatic-to-terrestrial pathways, which increase mortality risk and can skew sex ratios (Steen and Gibbs 2004, Aresco 2005); recreational activities such as swimming and boating that frequently interrupt feeding and basking; reduced aquatic habitat quality due to flow regulation; and high densities of non-native competitors (bullfrogs, red-eared sliders, and fish) or native predators that may be subsidized by human activity (e.g., crows, ravens, raccoons and skunks). Disturbance of nests, estivation, or overwintering sites during forest management activities, including prescribed fire, may result in injury or mortality of individuals. Activities that interrupt normal behaviors like basking can affect basic physiological processes, such as thermoregulation, and increase stress. Predation of nests and individuals by some of these sources has been noted to occur (Holland 1994, Rathbun et al. 2002, Bury et al. 2012) and the effects can be locally important (Holland 1994, Holte 1998). However, the overall effect of predation on population status and demography is unclear due to the persistence of and effective recruitment of individuals into populations co-existing with abundant predators (Rosenberg et al. 2009, Bury and Germano 2008, Bury et al. 2012).

Since dams on most major rivers draining the Sierra Nevada are common, the habitat complexity of these rivers and their floodplains has decreased due to extensive impoundment and flow regulations. Some of

the impacts to habitats include reduced pool volume, reduced retention of large woody debris, and reduced hydrological connections to off-channel pools (Reese and Welsh 1998, Ashton et al. 2015, Snover et al. 2015). Discharge regimes below dams also affect turtles and their habitats by releasing water colder than would occur in an unregulated state. Colder water has been found to result in reduced body size, a longer time to reproductive maturity in females, fewer gravid females of reproductive age, and increased physiological cost associated with the inability to simultaneously promote both growth and reproduction (Ashton et al. 2015, Snover et al. 2015). The consequences of cold water effects could have long-term population level effects because females would have fewer clutches due to prolonged time to reproductive maturity and clutch size may be smaller (Germano 2010, Snover et al. 2015).

Climate change may be an important variable for many populations of western pond turtle, especially for those occupying intermittent or ephemeral habitats. Declining water levels have been associated with departure from intermittent habitats and estivation in upland habitats, sometimes for periods in excess of 200 days and occasionally for very long times (>600 days) (Rathbun et al. 2002, Bondi and Marks 2012, Zaragosa et al. 2015, Purcell et al. 2017). Under the climate change scenarios predicting lower rainfall or extended drought in the Sierra Nevada, intermittent and ephemeral habitats could potentially provide suitable habitat for shorter periods of time or may not support suitable conditions annually (Leidy et al. 2016, Lovich et al. 2017, Purcell et al. 2017). Several recent studies documented occurrences of possible drought-related mortality events in western pond turtle populations. Purcell et al. (2017) documented high mortality of turtles in a pond environment following several years of drought. The seasonal pond used by the turtles did not refill annually as is typical, thereby forcing turtles to spend extensive time estivating on land (>400 days) without food or water (Purcell et al. 2017). The authors surmise mortality was due to starvation or predation based on obvious signs of scavenging. In another study, Leidy et al. (2016) documented extensive mortality in an intermittent stream in California; however, the cause of mortality is unknown but the authors suggest a likely association with impaired habitat conditions created by the drought. Evidence of scavenging was observed for most dead turtles and it is possible that the limited amount of available aquatic habitat increased predation risk for individuals (Leidy et al. 2016). In both instances, turtles were exposed to increased predation risk because habitat suitability was reduced by lack of water availability. In southern California, Lovich et al. (2017) documented the collapse of an abundant population of the southwestern pond turtle (*Actinemys pallida*) in four adjacent ponds in southern California, which was primarily due to gross changes in water chemistry associated with prolonged drought and runoff from a wildfire. While the exact causes of mortality are not clear, turtles were in poor physiological condition consistent with lack of feeding – possibly a consequence of the collapse of the food web in the ponds (Lovich et al. 2017). With the potential for more frequent drought periods in the future, and in addition to higher temperatures, natural systems like streams and ponds will be further stressed under changing climate scenarios (Diffenbaugh et al. 2015).

Several well defined threats are known to impact individuals and the habitats they rely upon which are likely to be exerting stresses on individuals that could cause some local populations to decline over several temporal scales. Populations with low connectivity and at the edges of the range are most vulnerable to stochastic events that could lead to localized extirpations. However, there are many successful reintroductions of turtles into ponds, lakes, and rivers across the species range where past activities precluded the turtles presence.

Forest-specific Rationale:

The Sequoia National Forest plan area does not have a lot of western pond turtle's preferred habitat, Sierra Nevada foothill ecosystems with aquatic habitat. There are two NRIS records in the Sequoia National Forest plan area that are from 1998 and located just south of the boundary with the Sierra National Forest. There no CNDDB or BISON records in the plan area. Western pond turtle has a wide

geographic range and utilizes a wide availability of aquatic habitats. The species is long lived with high adult survivorship and can have relatively high reproductive output over the lifetime of an individual; they appear to be capable of persisting and even thriving in marginal and highly modified habitats, including periods of prolonged drought as long as persistent water is available. Thompson et al (2016) classified this northern subspecies as Priority 3 (clearly at risk but likely not experiencing substantial and immediate threat of extirpation) and suggest population sizes are stable in several remaining populations in the southern part of the range, and in some areas, declines may have slowed or stopped. They further say unpublished field data indicate the species persist in some numbers throughout Merced and Fresno Counties as well as some areas of Kern County. On the Sequoia National Forest plan area, there is insufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area Based upon the evidence and supporting best available science, the western pond turtle does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

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Southern California legless lizard (aka Northern California legless lizard) - *Anniella stebbensi* (*A. pulchra*)

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Agriculture and other soil disturbance.

Rationale for Species

NatureServe Global Rank: G3 (for *A. pulchra*)

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Parham and Pappenfuss (2008) using mt and nuDNA found five previously unrecognized genetic lineages of *Anniella pulchra* that are evolving independently. In 2013, Papenfuss and Parham (2013) divided the

existing one species of legless lizard into five species based on the five lineages from their 2008 study, naming four new species and giving a new common name to the species now known as *Anniella pulchra*. One of these species, *Anniella stebbinsi*, is found in coastal sand dunes and a variety of interior habitats, including sandy washes and alluvial fans (Stebbins and McGinnis, 2012). Although Papenfuss and Parham (2013) proposed the common name, Southern California legless lizard, the 2017 SSAR Herpetological Circular No. 43 Standard Names List changed the common name of this species to San Diegan Legless Lizard.

Anniella stebbinsi is found in a broader range of habitats that any of the other species in the genus, including a disjunct northern populations occuring in sandy soils in the Breckenridge, Piute, and Tehachapi mountains, at elevations of 400–900 m, in both oak woodland and mixed conifer forest. It occurs in oak woodland, chaparral, reparian woodland, oak-pine forests, and desert scrub. It requires loose fine soil or litter to borrow, and adequate soil moisture, warmth, and surface cover such as rocks, logs, bushes, or matlike herbaceous growth. Much of the coastal dune habitat has been destroyed by coastal development between Ventura County and the Mexican Border. Fortunately, a large protected population persists in the remnant of the once extensive El Segundo Dunes at Los Angeles International Airport.

Sequoia National Forest Rationale

A museum record for *A. pulchra* is from the Sequoia National Forest plan area; there are no CNDDB records from the Sequoia National Forest. Parham and Papenfuss (2009) and Papenfuss and Parham (2013) collected additional specimens in the plan area, and based on morphology and genetic differentiation, proposed populations found in the Breckenridge and Piute Mountains is part of a newly described species, *A. stebbinsi*, with a wide-ranging cryptic lineage that occurs throughout Southern California and into Baja California, Mexico. Outside Sequoia National Forest plan area, the vast extent of the range of *A. stebbinsi* is likely compromised by urban development. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Terrestrial Invertebrates

Tight coin - *Ammonitella yatesii*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Disturbance, degradation or loss of habitat to microsite conditions due to recreation activities. Loss of habitat due to fire, drought conditions and climate change.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: S1

Other Designations: CA-SGCN

Ammonitella yatesii is a member of the genus *Ammonitella*, air-breathing land snails in the family Megomphicidae. This very small family is represented in the Pacific Northwest and Northern California by just two genera, *Polygrella* and *Megomphix*, along with *Ammonitella* in Central California (USDA/USDI 2013). This genus was first documented in the early 1920's by Pilsbry, with the species *Ammonitella gabrielense* and shortly following was J.G. Cooper's discovery of *Ammonitella yatesii* (ANSP 2018).

The majority of *Ammonitella* species utilize rocky outcrops, scree slopes and carbonate calcareous cliff and cave habitat, where moisture is present from seeps and spring (ANSP 2018). Since *Ammonitella* species lack an operculum, microsite conditions with wet, moist substrate or high humidity are essential. Microsite conditions also favor areas where calcium is readily available, since land snails and most mollusks require calcium as a nutrient source for shell growth.

Most land snails are foraging generalists and will feed on live and dead material. They are essential in ecosystems as detritivores and decomposers, along with providing a link to ecosystem food chains. In addition, due to limited mobility, home ranges, tend to be very small, only a few acres in some cases (Burke 2013). As a result, microsite conditions may be the most important factor limiting terrestrial snail abundance, since the assemblage of habitat components including access to a substrate of calcareous carbonate (often cliffs habitats or talus slopes), sufficient moisture (even in arid environments), and food consisting of herbaceous materials such as decaying leaf litter are critical for persistence (Burch and Pearce 1990).

However, the known locations of *Ammonitella yatesii,* suggest that the habitat is more specialized than most land snails. Known locations include Mercer's Cave, Boyden's Cave on the King River, King's Canyon on the Giant Sequoia National Monument (ANSP 2018). This species has very little capability to

disperse and even relatively small barriers are limiting. Drought and climate changes are threats as well as stochastic events that might affect these sparse locations.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

This species is found on the Sequoia National Forest in the Kings Canyon area, within Giant Sequoia National Monument, with two locations recorded in CNDDB. There are no known occurrences in the Sequoia National Forest plan area.

Key ecological conditions for this species

Key ecological conditions for this species include carbonate calcareous crevices and talus, typically on steep slopes and caves where moisture and high humidity are retained. Caves and abandoned mines provide these specific ecological conditions.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

Although this species has a restricted habitat, cave habitat and rocky outcrop habitat is not limited. Recreation use does take place in such habitat. Sites like Crystal Cave, is a popular location for tourists and as are areas on forest in the Kings Canyon., where activities such as hiking, recreational caving and rock climbing are common.

The projected status of those ecological conditions relative to the species considered

As fire severity and intervals increase, degradation and loss of habitat on talus and scree slopes for this species will also increase.

Since land snails have limited mobility, poor active dispersal ability, and are very sensitive to desiccation, they are highly vulnerable to fire itself and to subsequent habitat destruction (Burke 1999). In consequence, post-fire return of this group is expected to be slow. According to Burke (1999), intense fire events can result in the persistence of only a small fraction of mollusk fauna for many years (possibly a century or more). Less-severe fires leaving numerous large, minimally charred logs in the stand result in a greater portion of mollusk survival (Burke 2013).

More climate change is expected and warmer temperatures, along with more rain than snow are occurring. This change will intensify trends in fire, insect and pathogen outbreaks, and drought-related tree mortality. As a result, microsite conditions on rocky steep slopes that include high humidity and moisture will be impacted (USDA 2013).

Recreation use is expected to continue in the Kings Canyon area and surrounding areas where this habitat occurs.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

As with other species with a limited range, stochastic events are a significant threat to the persistence of this species. Events such as fire, flood, disease, habitat alteration, or climate change can significantly impact a limited range animal. Habitat alteration such as recreation activities pose the greatest threat to

this species. As few studies have investigated this species, additional research needs to be conducted to determine what additional threats are most significant for this species.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

The tight coin snail is restricted to carbonate calcareous cave, talus and rocky outcrop habitat in the Giant Sequoia National Monument. There are no records for this species within the plan area. Additional surveys are necessary to determine distribution in the plan area. At this time, *there is insufficient information to demonstrate substantial concern for long-term persistence in the plan area*. Based upon the evidence and supporting best available science, tight coin snail does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Crotch Bumble Bee – *Bombus crotchii*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly disturbance, degradation or loss of habitat to microsite conditions due to recreation or mining activities. Loss of habitat due to high-intensity fire, drought conditions and climate change.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: None

State Rank: S1S2

Other Designations: IUCN Red List Category: EN – Endangered

This species occurs primarily in California, including the Mediterranean region, Pacific Coast, Western Desert, Great Valley, and adjacent foothills through most of southwestern California. It has also been documented in southwest Nevada, near the California border (Thorp et al., 1983). This bee lives in grassland and scrub habitat types, tolerates hotter and drier habitat types than do most bumblebees, and nests underground. Its food plants include milkweeds, lupines, medics, phacelias, and sages. Although historically common in the Central Valley, it appears to be absent from most of it, especially in the center of its historic range.

Sequoia National Forest Rationale

Of 234 occurrences in CNDDB, there are 2 records from the Sequoia NF plan area. The exact locations are unknown on these records that were made from 1971 to 1979.

There is insufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

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Monarch (California overwintering population) - *Danaus plexippus pop. 1*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant threats to species:

Habitat loss and destruction, both overwintering habitat and breeding habitat.

Rationale for Danaus plexippus pop. 1

NatureServe Global Rank: G4

NatureServe T Rank: T2T3

State Rank: S2S3

Other Designations: CA-SSC; CA-SGCN

The monarch butterfly, *Danaus plexippus*, may be the most familiar North American butterfly, and is considered an iconic pollinator species. The global rank for the species is G4 (Apparently Secure), but it has a T2T3 (Imperiled to Vulnerable) ranks for the California overwintering population. The state ranks is S2S3 (Imperiled to Vulnerable) in California where it is also a CDFW Species of Special Concern and an Invertebrate Species of Greatest Conservation Need. The monarch butterfly is not currently listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) or protected specifically under U.S. domestic laws. However, there has been a major push to conserve the monarch butterfly, which has been largely fueled by reports of the declining numbers of overwintering monarchs. Given the concern over the overwintering numbers, the Center for Biological Diversity, the Center for Food Safety, the Xerces Society and Lincoln Brower have filed a petition to the United States Department of the Interior to protect the monarch by having it federally protected and that petition is still under review as of December 2014. The species is a Regional Forester's Sensitive Species for the Los Padres National Forest in Region 5; and a Tuolumne County special status species.

In 2014, President Barack Obama issued a Presidential Memorandum entitled "Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators". The Memorandum established a Pollinator Health Task Force, to be co-chaired by the Secretary of Agriculture and the Administrator of the Environmental Protection Agency, which stated: that the number of migrating monarch butterflies sank to the lowest recorded population level in 2013–14, and there is an imminent risk of failed migration.

The eastern population annually completes a 4,800 km (3,000 mi) migration between overwintering sites in the highland oyamel fir (*Abies religiosa*) forests of Michoacán State in Mexico and southern Canada. West of the Rocky Mountains, monarchs overwinter in sheltered groves along the California coast, where it is considered to be rare with a restricted range. NatureServe provides a global rank of G4 but a rank for the North American subspecies as T2T3 (Imperiled to Vulnerable) and a state rank for California S2S3 (Imperiled to Vulnerable).

Abundance at California winter habitats has been monitored since 1997 at over 170 locales as part of the annual Western Monarch Thanksgiving Counts (See Monarch Watch), analyses indicates that population numbers declined from a high of 1,237,487 monarchs in 1997 to only 99,063 in 2002 (Stevens and Frey 2004). Ongoing monitoring conducted by the Xerces Society and Mia Monroe has determined that the overwintering population in California was 292,674 monarchs in 2015 (Pelton et al. 2016).

Recent declines in monarch overwintering populations along the California Coast have been precipitous: more than one million individuals were counted at 101 sites during 1997, while in 2008 only 130,000 individuals were counted at 115 sites, the majority of which were the same. Even at the most populous sites declines have been about 50%. At the overwintering grove in Ellwood, near Goleta, populations have declined from an estimated 200,000 to 20,000 during this same period. Recently at some groves, monarchs have entirely disappeared and appear to have been extirpated.

Increasing drought conditions in the west seem the most likely system-wide cause for declining populations. In the west, deficits in precipitation have been shown to reduce both milkweed biomass and shorten its late summer availability. Stevens and Frey (2004) reported that that nearly 99% of the variation in western monarch abundance (data for Arizona, California, Nevada, and Oregon) between the El Nino event in 1998 and 2003 was explained by variation in PDSI values, that the extent and severity of the drought increased significantly over this time period and the decline in monarch abundance coincided with increasingly severe drought conditions throughout the west.

The Xerces Society maintains a Western Monarch Overwintering sites Database and reports that the distribution of monarchs among overwintering sites changes over the season and annually, based on regional and individual site conditions. Populations of overwintering monarchs have been declining since regular monitoring began in 1997 (Pelton et al. 2016). In 2016, only 221 of the 412 known overwintering sites were listed as actively occupied. Severe storms in the winter of 2016-2017 have had profound impacts on the eastern monarch population as they overwintered in Mexico, strong storms at the tail end of last season destroyed 54 hectares of monarch habitat in Mexico (Monarch Watch 2017). Winter storms also affected coastal California, but the damage as yet to overwintering monarch populations is unreported.

NRIS database includes the following information: Eldorado NF – noted collections from NRIS; Los Padres NF – known overwintering sites; Plumas NF – noted collections from NRIS.

Sierra National Forest Rationale

There are known records at Jennie Lakes Wilderness Area, near Kennedy Meadows, Rancheria Creek in Piute Mountains, and along Hwy 155 approximately 8-16 kilometers (5-10 miles) west of Wofford Heights in the Greenhorn Mountains. Monarch butterflies also have been observed adjacent to Sequoia National Forest at the following sites: Giant Sequoia National Monument, Kings Canyon National Park, a riparian area near Burning Moscow Spring in the Jawbone/Butterbredt Area of, and near Wilsonia and Springfield, CA (WMMOD 2017).

There is a historic breeding record on Sequoia National Forest plan area, along Hwy 155 approximately 8-16 kilometers (5-10 miles) west of Wofford Heights in the Greenhorn Mountains (WMMOD 2017). It is a dateless record. There are no known overwintering populations. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered:

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Brower, A.V. Z. and M.M. Jeansonne. 2004. Geographical populations and "subspecies" of New World monarch butterflies (Nymphalidae) share a recent origin and are not phylogenetically distinct. Ann. Entomol. Soc. Am. 97(3): 519-523.

CDFW 2016. California Natural Diversity Database (CNDDB): California Department of Fish and Game. https://nrm.dfg.ca.gov/. Accessed 01/14/2017.

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Lyons, J.I., A.A. Pierce, S.M. Barribeau, E.D. Sternberg, A.J. Mongue and J.C. de Roode. 2012. Lack of genetic differentiation between monarch butterflies with divergent migration destinations. Molecular Ecology 21: 3433–3444.

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Pelton E., S. Jepson, C. Schultz, C. Fallon and S.H. Black. 2016. State of the Monarch Butterfly Overwintering Sites in California. 40+vi pp. Portland, OR: The Xerces Society for Invertebrate Conservation. Accessed at www.xerces.org Jan. 5, 2017.

Stevens, S. and D. Frey. 2004. How the other half lives: monarch population trends west of the great divide. Biological Sciences Department, California Polytechnic State University. San Luis Obispo, California. 7 pp.

Stevens, S.R. and D.F. Frey. 2010. Host plant pattern and variation in climate predict the location of natal grounds for migratory monarch butterflies in western North America. J Insect Conserv. 14: 731–744.

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Xerces Society for Invertebrate Conservation. 2017. http://www.xerces.org/monarchs/ last accessed 02/24/2017.

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Tehachapi shoulderband - *Helminthoglypta berryi*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Disturbance and degradation or loss of habitat.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Helminthoglypta berryi is known from the San Bernardino and Tehachapi Mountains. It was photographed in the Tehachapi Mountains in 2018.

Sequoia National Forest Rationale

There are no known occurrences of this species in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based on the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Kern shoulderband - *Helminthoglypta callistoderma*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Disturbance and degradation or loss of habitat.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: S1

Other Designations: None

Kern shoulderband is endemic to California, known only from the Kern River, 2 miles north of Bakersfield in Kern County. In a 2001, US Department of Transportation and State of California (2001) summarized that specimens of Kern shoulderband were first collected on an island in the river and on dead vegetation at the edge of the water in 1916. Substantial alteration of water flow patterns and urban development have occurred and the species may be extinct.

Most land snails are foraging generalists and will feed on live and dead material. They are essential in ecosystems as detritivores and decomposers, along with providing a link to ecosystem food chains. In addition, due to limited mobility, home ranges, tend to be very small, only a few acres in some cases (Burke 2013). As a result, microsite conditions may be the most important factor limiting terrestrial snail abundance, since the assemblage of habitat components including access to a substrate of calcareous carbonate (often cliffs habitats or talus slopes), sufficient moisture (even in arid environments), and food consisting of herbaceous materials such as decaying leaf litter are critical for persistence.

Sequoia National Forest Rationale

There are no records of Kern shoulderband occurrences in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

US Department of Transportation and State of California. 2001. Final Tier 1 Environmental Impact Statement/Environmental Impact Report: Adoptions of Alignment, State Highway Route 58, Interstate 5 to State Route 99, Kern county, California. US Department of Transportation, Federal Highway Administration and State of California, Department of Transportation.

Yucca shoulderband - *Helminthoglypta isabella*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly unauthorized OHV travel, road maintenance, vegetation management, reductions in course woody debris, severe wildfire. Threats from climate change, earlier snowmelt, and longer and hotter summers.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

This species is known only from the type vicinity (Berry 1938) south of Isabella Reservoir, where the species still persists at a series of limestone outcrops in a predominantly granitic region (Goodward et al. 2017). Elevations of three localities range from 939 to 1016 m (3,081-3,333 ft). It was described as being found underneath dead clumps of *Hesperoyucca whipplei*, but Goodward et al. (2017) found it under rocks and in rock crevices. The habitat of *H. Isabella* is dry rocky slopes with open chaparral including scattered oaks and pines (Goodward et al. 2017). It is cryptic, small, and only found after rainfall.

Similar habitat is found in Long Canyon Research Area above South Lake and in the Bodfish Piute Cypress Botanical Area (Calflora) on the forest. The recent relocations of the species around South Lake

in limestone cliffs (Goodward et al. 2017) indicates it might be present in similar nearby habitat in Long Canyon or in the forest near Bodfish.

Sequoia National Forest Rationale

Helminthoglypta Isabella does not have a known occurrence in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based on the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Goodward, D.M., Gilbertson, L.H., Rugman-Jones, P.F. and Riggs, M.L., 2017. A contribution to the phylogeography and anatomy of Helminthoglyptid land snails (Pulmonata: Helminthoglyptidae) from the deserts of southern California. Bulletin, Southern California Academy of Sciences, 116(2), pp.110-136.

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California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

Natureserve. 2018. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 8 February 2018].

Breckenridge shoulderband - *Helminthoglypta orina*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Disturbance and degradation or loss of habitat.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Most land snails are foraging generalists and will feed on live and dead material. They are essential in ecosystems as detritivores and decomposers, along with providing a link to ecosystem food chains. In addition, due to limited mobility, home ranges, tend to be very small, only a few acres in some cases). As a result, microsite conditions may be the most important factor limiting terrestrial snail abundance, since the assemblage of habitat components including access to a substrate of calcareous carbonate (often cliffs habitats or talus slopes), sufficient moisture (even in arid environments), and food consisting of herbaceous materials such as decaying leaf litter are critical for persistence.

Sequoia National Forest Rationale

The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based on the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Yosemite shoulderband - *Helminthoglypta proles*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Disturbance and degradation or loss of habitat.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Yosemite shoulderband, endemic to California, was first described in 1892 from a specimen near Fraser's Mill in Tulare County, at 6,280 freet elevation.

Most land snails are foraging generalists and will feed on live and dead material. They are essential in ecosystems as detritivores and decomposers, along with providing a link to ecosystem food chains. In addition, due to limited mobility, home ranges, tend to be very small, only a few acres in some cases (Burke 2013). As a result, microsite conditions may be the most important factor limiting terrestrial snail abundance, since the assemblage of habitat components including access to a substrate of calcareous carbonate (often cliffs habitats or talus slopes), sufficient moisture (even in arid environments), and food consisting of herbaceous materials such as decaying leaf litter are critical for persistence.

Sequoia National Forest Rationale

There are no records of Yosemite shoulderband occurrences in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

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Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Erskine Creek shoulderband - *Helminthoglypta stageri*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Disturbance and degradation or loss of habitat.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Helminthoglypta stageri was described in 1938.

Sequoia National Forest Rationale

There are no records of Erskine Creek shoulderband occurrences in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Tulare shoulderband - *Helminthoglypta tularensis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Disturbance and degradation or loss of habitat.

Rationale for Species

NatureServe Global Rank: G1

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

This species is endemic to California.

Sequoia National Forest Rationale

There are no records of Tulare shoulderband occurrences in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

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Boisduval's blue - *Plebejus icarioides inyo*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly invasive plants, pesticides for removal of invasive species, recreational development, mining, and road building.

Rationale for Boisduval's Blue

NatureServe Global Rank: G5

NatureServe T Rank: T1T3

State Rank: SNR

Other Designations: None

Plebejus icarioides has a wide distribution with occurrences from British Columbia east to the western edge of the Great Plains, south to New Mexico, Arizona, southern California, and Baja California. Generally, this species is found in forest clearings and edges, prairie, sagebrush, chaparral, coastal dunes, fields.

Many of the subspecies of *Plebejus icarioides,* blues, are rare to their known locality and do separate by species, sometimes even at a puddle (Shapiro 2017). *Plebejus icarioides* has one brood, from April-June at Gates Canyon, and from June-August (rarely later) at higher elevations. Their host plants are many species of perennial lupines, but tend to have the preferred species varying by locality. Adults visit a great variety of flowers, including pink pussy paws, wild buckwheats, and composites. In Sierra Valley, they can often be found with the host plant far out in sagebrush steppe, where nothing (or nothing but lupine, which they do not use as a nectar source) seems to be in bloom.

Plebejus icarioides inyo occurrences are considered widespread in the Inyo Mountains. Very little is known about subspecies.

Forest-Specific Rationale

Plebejus icarioides inyo has no occurrences on the Sequoia National Forest plan area. Based on the evidence and supporting best available science, *Plebejus icarioides inyo* does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Lupine blue or Green blue- *Plebejus lupini chlorina*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Encroachment of meadows, drought, and invasion of non-native species.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T1

State Rank: SNR

Other Designations: None

Sequoia National Forest Rationale

Plebejus lupini chlorina may be a full species within the lupini complex (Davenport 2014); true chlorina may be a different biological species than monticola which might be limited to only Tehachapi Mountains. *Eriogonum umbellatum* is the larval host in the Sierra Nevada. Collecting in recent years has shown that chlorina is far more common and widespread than previously believed. Davenport (2014) states that *Plebejus lupini chlorina* is distributed in the:

> higher slopes of the Tehachapi Mountains where *E. umbellatum* grows. Populations also occur in the Frazier Park area and in the McGill Campground area on Mt. Pinos. Sierra Nevada and subranges: Skinner Peak, Piute Mountains (Piute Mountain, Vista and Piute Mountain Rd. south of Lake Isabella between milepost 6 and 7) where adjacent populations with *P. lupini monticola* on July 5, 2002 were found on different hosts, Greenhorn Mountains at several sites including Old State Road (5.4 to 6.1 mi above Wofford Heights), 1 mi. south of Tiger Flat, 1-2 mi east of Black Mountain. Saddle and Baker Ridge, in southern Sierra Nevada and Kern Plateau along Sherman Pass Rd. from 4 mi. west of summit to area around Bald Mountain up to 9,300.' Chlorina first appeared at the Alder Creek Crossing at 6,800' July 5, 2009 and had a good colony. Common at Pine Flat at the south end of the Kern Plateau in early July.

Since lepidopterist's previously did not recognize chlorina and monticola as two separate biological entities with different host plants, these blues are poorly understood and their distributions are actually unknown. Preliminary studies suggest that the entity known as argentata is actually a synonym of chlorina. Taxonomic understanding of "lupini" in the southern Sierra Nevada has been confused due to at least three or more separate species in this complex in this area. It was not recognized that chlorina occurred there until very recently. Recent field work has established that chlorina is well established in this region, but was long overlooked or unrecognized (Davenport 2014). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Davenport, K. 2014. Butterflies of North America 3.4 Butterflies of Kern and Tulare Counties, California. Annotated Checklist of Butterflies of Kern and Tulare Counties, California; *Field Collecting and Sight Records for Butterflies of Kern and Tulare Counties, California;*Butterflies of Sequoia and Kings Canyon National Parks, Tulare and Fresno Counties, California Contributions of the C.P. Gillette Museum of Arthropod Diversity Colorado State University.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Veined blue - *Plebejus neurona*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly invasive species affecting hostplant.

Rationale for Species

NatureServe Global Rank: G2G3

State Rank: SNR

Other Designations: None

Plebejus neurona is endemic to California. Occurs from the southernmost Sierra Nevada south through the Tehachapi Mountains, and mountains of San Bernardino, Ventura and Los Angeles Counties (Butterflies and Moths of North America 2018). Distribution records from Davenport (2014) for Kern and Tulare Counties include over 20 occurrences. The northernmost records are in Tulare County from the Sherman Pass Road; west of the Pass at lower elevation with a colony site 1 mi. northwest of Bald Mountain at about 8,000', on metasedimentary rock outcrops where *Eriogonum wrightii* (adults visit *E. umbellatum* for nectar) is present. It is also on the northeast side of Lamont Peak (Chimney Peak Rd. near Lamont Meadows) at the south end of the Kern Plateau. Kern County records include the Sageland-Kelso Valley region, Bird Spring Pass, Butterbredt Peak, Piute Mountains including Hooper Hill and Erskine Crk., Tehachapi Mountains, Frazier Park, and Mt. Pinos. Often common near the E. wrightii host. The larval foodplant is the buckwheat *Eriogonum wrightii* and adults visit *E. umbellatum* for nectar. Both species of buckwheat are common through its range.

Forest-Specific *Rationale*

Information on current distribution of the species on the planning unit

P. neurona occurrences on the Sequoia National Forest plan area include the Tulare County records at Sherman Pass Road, west of the pass at lower elevation with a colony site 1 mi. northwest of Bald Mountain at about 8,000', on metasedimentary rock outcrops where *Eriogonum wrightii* (adults visit *E. umbellatum* for nectar) is present. Kern County records in the Piute Mountains including Hooper Hill and Erskine Crk. Recent observations from 2005 were from Erskine Creek near Lake Isabella, and southern Greenhorn Mountains (Davenport 2018).

Key ecological conditions for this species

Species is found on metasedimentary or other rock outcrops where *E. wrightii* and *E. umbellatum* are present. These Eriogonum species are common in the Sierra Nevada and adjacent mountains.

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

California buckwheat (*Eriogonum spp.*) are present and common in the Sherman Pass area, Kern Canyon, near Lake Isabella, and in Breckinridge and Piute Mountain streams.

The projected status of those ecological conditions relative to the species considered

Climate changes such as warmer temperatures, less snowpack, earlier snowpack melting, and drought may influence butterfly emergence and flight timing, and numbers of generations per year. The flowering phenology responds to temperature increase and earlier snowmelt due to climate change.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

None known. Monitoring of populations is suggested to study the effects of fire, grazing, and exotic weeds.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

Plebejus neurona is endemic to California; it occurs from the southernmost Sierra Nevada south through the Tehachapi Mountains, and mountains of San Bernardino, Ventura and Los Angeles Counties (Davenport 2018). *P. neurona* occurrences on the Sequoia National Forest plan area include areas in the Sierra Nevada and Piute Mountains. The buckwheat foodplant and nectar plant species of Eriogonum are common. There a many recent records for this species in the plan area and no direct threats have been identified. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Kings Canyon National Parks, Tulare and Fresno Counties, California Contributions of the C.P. Gillette Museum of Arthropod Diversity Colorado State University

Davenport, K. 2018. Lepidoptera of North America 15, Butterflies of southern California in 2018: updating Emmel and Emmel's 1973 Butterflies of southern California. Contributions of the C.P. Gillette Museum of Arthropod Diversity Colorado State University. 175 pp.

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Arrowhead arctic blue - *Plebejus podarce cilla* (*Agriades podarce cilla*)

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Potential for impacts from recreation, degradation or loss of habitat due to ground disturbance, fire suppression equipment and road maintenance.

Rationale for Species

NatureServe Global Rank: G3G3

NatureServe T Rank: T2T3

State Rank: SNR

Other Designations: None

Plebejus podarce cilla has been observed in Tulare County, in Kings Canyon and Sequoia National Parks south to Big Meadow on the Kern Plateau (there are two Big Meadows in Tulare County, the other is near Kings Canyon National Park). It has also been observed in the Sherman Pass area. This is a locally common Sierra Nevada butterfly that occurs in wet subalpine meadows with the shooting star host, *Primula* spp. The flight length on the Kern Plateau east of Sherman Pass is lengthened in wet years.

Sequoia National Forest Rationale

Arrowhead arctic blue occurs is found on the Kern Plateau, on the Sequoia National Forest plan area. Reported to be common in this area (Davenport 2014, 2018) and the species is observed and photographed. The host, *Primula jeffreyi*, is found along Sherman Pass road and typically occurs in wetlands but occasionally is found in non-wetland areas. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

San Emigdio blue - *Plebulina emigdionis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Invasive species, fires, unauthorized OHV use, road expansion, agricultural and urban development.

Rationale for San Emigdio Blue

NatureServe Global Rank: G1G2

NatureServe T Rank: None

State Rank: S1S2

Other Designations: FS-SS

San Emigdio blue butterfly *Plebejus emigdionis* is a rare and localized species. Isolated populations occur in the Owens Valley and it has been reported from Inyo, Kern, Los Angeles, San Bernardino and Ventura counties (Davenport 2004, Emmel and Emmel 1973, Garth and Tilden 1986). It has been collected along the Mojave River near Victorville (north of the San Bernardino National Forest). Isolated colonies have been reported from Bouquet and Mint Canyons near Castaic, in canyons along the north side of the San Gabriel Mountains near the desert's edge, and in arid areas south of Mount Abel near San Emigdio Mesa (Emmel and Emmel 1973, Murphy 1990). The most concentrated area is around Sand Canyon and Lake Isabella. Pratt (2011) reports concerns that each of the populations are gradually being lost. Penrod *et al.* (2002) and Stephenson and Calcarone (1999) state that the San Emigdio blue populations have been in decline due to urbanization near Victorville and along the Mojave River.

Populations are generally localized along perennial and intermittent streams. Typical occupied habitats are along dry river beds, intermittent streams and adjacent flats. The San Emigdio blue butterfly is associated with an ant (*Formica pilicornis)*, a scale species (*Ceroplastes irregularis)*, and one of three *Atriplex* or shadscale plant species (*Atriplex lentiformis, A. cannescens,* and *A. polycarpa*). *Atriplex canescens* (Figure 2) is the most important. The presence of the scale is the most critical variable. Without the scale, the ant is not present which protects the larvae against parasitism (Pratt 2011). Pierce *et al.* (2002) describes the importance of ant/larval dependence for many species in this family of butterflies. Typically, the larva produce honeydew harvested by ants and the ants protect the larva from predators. Limited range is believed to be due to symbiotic relationship with ant species *Formica pilicornis* (Murphy 1990). The host plant, *Atriplex canescens*, is widespread; the distribution of the butterfly is much more localized and may indicate that other factors are important in habitat suitability (Emmel and Emmel 1973; Stephenson and Calcarone 1999).

The largest threat to this species is urbanization and habitat loss. A general threat to butterflies, especially rare butterflies, is that of collectors. Disturbances and destruction of habitat as a result of fire suppression activities (dozerlines, handlines, staging, etc.), road maintenance activities, and illegal off-highway vehicles are the threats to this species and its habitat.

The effects of climate change on butterfly populations are difficult to assess but it is likely that changes in temperature extremes and precipitation could affect host availability and thus affect butterfly population viability. More information on the status and ecological requirements of these populations are required in order fully assess potential threats.

Forest-Specific Rationale

Information on current distribution of the species on the planning unit

No occurrences are documented in the forest plan area, including no entries in NRIS wildlife. The California Natural Diversity Database (CNDDB) records for San Emigdio blue were reviewed for records within the Sequoia National Forest and within 5 miles of the boundary. There are several records outside the forest boundary; there are no CNDDB records within the plan area. The records include multiple specimens and years of collecting or photographing in the same area. This includes the Kern River Preserve near the South Fork Wildlife Area and east of Isabella Lake. Kern River Preserve (2008) reports during the 2008 South Fork Butterfly count in late April, 42 San Emigdio Blue butterflies were found in a restored area in the Kern River Preserve.

Key ecological conditions for this species

The key ecological conditions for this species is shadscale scrub communities, which include saltbush (*Atriplex spp.*), buckwheat (*Eriogonum spp.*), and annual wildflowers. It includes the presence of the ant species, *Formica pilicornis*, in which this butterfly has a symbiotic relationship (Murphy 1990, Balmer and Pratt 1991, Pratt 2011). As stated above, limited range of San Emigdio blue is believed to be due to symbiotic relationship with ant species *Formica pilicornis* (Murphy 1990). The host plant, *Atriplex canescens*, is considered common within its range while the distribution of the butterfly is much more localized and this indicates other factors are important in habitat suitability (Emmel and Emmel 1973; Stephenson and Calcarone 1999).

The current status of ecological conditions on the planning unit based on the assessment of key ecosystem characteristics

The key ecological conditions in Kern County exist where the desert and mountain regions meet. The primary foodplant, fourwing saltbush (*Atriplex canescens*), is limited in distribution in the forest plan area, with locations including Short Canyon and Scodie Mountains in the Kiavah Wilderness. This species continues to be locally common around Weldon, located along the South Fork of the Kern River near Lake Isabella and on the northern edge of Kelso Valley (SFKP, Davenport 1983). The primary larval habitat is *Atriplex canescens*. Since most desert species fly during the spring months of April and May, the species may be highly seasonal and tied to larval development. This species is symbiotic with Formica ants (Ballmer and Pratt 1991), although there is uncertainty about the protection of larvae by the ants, as larvae are smaller when ants demand feeding (Fielder 2011).

The projected status of those ecological conditions relative to the species considered

The primary foodplant, *Atriplex canescens*, is not considered to be a rare species in its habitat (NatureServe 2016), however,its distribution in the plan area is limited.

The ecological conditions not assessed by the assessment of key ecosystem characteristics

N/A

Key risk factors arising from non-ecosystem conditions and/or management activities

Habitat outside the Sequoia National Forest is subject to destruction due to agricultural and urban development. Recently several parcels of habitat in the Kern River Valley where this rare species of butterfly was documented have been plowed by private landowners. Windblown herbicides sprayed along highways could blow into the areas with this species. Improper applications of fungicides or herbicides on private lands could harm this species.

A summary of the overall at-risk status along with a conclusion as to whether or not the species was considered at risk for persistence on the planning unit

San Emigdio blue is very local to southern California, from Inyo County south through the Mojave Desert, San Joaquin Valley, Bouquet and Mint Canyons, and Los Angeles County in the desert scrub habitats that include desert saltbush species (*Atriplex*) and associated scale insects and ants. San Emigdio blue is rare and localized compared to its primary foodplant, *Atriplex canescens*; believed to be due in part to its symbiotic relationship with the ant species *Formica pilicornis*. This symbiotic relationship, paired with potential habitat fragmentation or loss due to agricultural expansion and invasive species threats, limits this species ability to persist in those areas. However, there are no known occurrences of this species in the plan area. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon

the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Hydaspe fritillary - *Speyeria hydaspe viridicornis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly invasive species, fires, unauthorized OHV use, road expansion, agricultural and urban development.

Rationale for Species

NatureServe Global Rank: G4G5

NatureServe T Rank: T1T2

State Rank: SNR

Other Designations: None

Speyeria hydaspe viridicornis occurs in montane and upper montane forests and the hostplants are Violas. This subspecies was once considered to be limited to a small population endemic to the Greenhorn Mountains but is now known to have a very good-sized range and distribution. Although the typical hydaspe species is also present, viridicornis has populations as far north as El Dorado County, California. The best known area in the range is Shirley Meadows in the Greenhorn Mountains, the type locality for Speyeria hydaspe viridicornis. This fritillary appears to be absent on the Kern Plateau but reappears again to the north at Peppermint Creek and Freeman Creek Grove.

Sequoia National Forest Rationale

Within the Sequoia National Forest plan area, this species can be abundant in the Greenhorn Mountains from the area of Shirley Meadows to the top of the ski slope, north along Greenhorn Crest, to Portuguese Pass, Balch Park, Quaking Aspen, and Camp Nelson. Adults are easily observed on Viola flowers. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

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Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Juniper hairstreak - *Callophrys siva juniperaria* (*Callophrys gryneus juniperaria*)

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly invasive species, fires, and unauthorized OHV use.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T2T3

State Rank: SNR

Other Designations: None

Callophrys siva juniperaria occurs in Kern, Los Angeles, San Bernardino and Tulare Counties. This species utilizes *Juniperus californica* as the larval host; adults perch high on the junipers or visit nearby flowers.

Callophrys gryneus (Hubner, 1819) and *Callophrys siva* (W. H. Edwards, 1874) are considered conspecific. There is a complex of species in the *Callophrys gryneus* and *Callophrys siva* groups; they are in southern California and have a contentious taxonomy (Davenport 2018).

Sequoia National Forest Rationale

Records of occurrences that are in or near the plan area include from the east side of Greenhorn Mountains, Butterbredt Peak, Bird Spring Pass, Tehachapi Mountains, Frazier Park, Bodfish, and Piute Mountains, all in Kern County. The only Tulare County records are from upper Kern Canyon. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Davenport, K. 2014. Butterflies of North America 3.4 Butterflies of Kern and Tulare Counties, California. Annotated Checklist of Butterflies of Kern and Tulare Counties, California; *Field Collecting and Sight Records for Butterflies of Kern and Tulare Counties, California;*Butterflies of Sequoia and Kings Canyon National Parks, Tulare and Fresno Counties, California Contributions of the C.P. Gillette Museum of Arthropod Diversity Colorado State University.

Davenport, K. 2018. Lepidoptera of North America 15, Butterflies of southern California in 2018: updating Emmel and Emmel's 1973 Butterflies of southern California. Contributions of the C.P. Gillette Museum of Arthropod Diversity Colorado State University. 175 pp.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Comstock's blue - *Euphilotes glaucon comstocki*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly invasive species, fires, and unauthorized OHV use.

Rationale for Species

NatureServe Global Rank: G5

NatureServe T Rank: T1T3

State Rank: S2

Other Designations: None

Sequoia National Forest Rationale

Euphilotes glaucon comstocki is very common and widespread in the Piute and Greenhorn Mountains and on the Kern Plateau in the Sierra Nevada. It is scarce in the Tehachapi Mountains where it was firest described. *Euphilotes glaucon comstocki* is often observed in the Piute, Greenhorn and Sierra Nevada Mountains with *Euphilotes bernardino* on *Eriogonum fasciculatum* and *comstocki* at lower elevations and on *Eriogonum unbellatum* at higher elevations (Davenport 2018).

The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Davenport, K. 2018. Lepidoptera of North America 15, Butterflies of southern California in 2018: updating Emmel and Emmel's 1973 Butterflies of southern California. Contributions of the C.P. Gillette Museum of Arthropod Diversity Colorado State University. 175 pp.

Davenport, K. 2018. Lepidoptera of North America 15, Butterflies of southern California in 2018: updating Emmel and Emmel's 1973 Butterflies of southern California. Contributions of the C.P. Gillette Museum of Arthropod Diversity Colorado State University. 175 pp.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

Small-spotted gorgon copper - *Lycaena gorgon micropunctata*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Possibly invasive species, fires, and unauthorized OHV use.

Rationale for Species

NatureServe Global Rank: G3G4

NatureServe T Rank: T1

State Rank: SNR

Other Designations: None

Lycaena gorgon micropunctata is an endemic subspecies to California that inhabits sandy soils on road banks inhabited with the host yellow flowered *Eriogonum nudum* (Davenport 2018). Occurrences range from Inyo, Kern, and Tulare Counties. Locations include Lower Rock Creek, Upper Ninemile Canyon, Butterbredt Peak, Lamont Peak, and Piute Mountains (Davenport 2014). It is commonly observed on Chimney Peak Road. where the host *Eriogonum nudum* is abundant. *Lycaena gorgon micropunctata* differs from nominotypical gorgon by its smaller size and markings.

Davenport (2014 and 2018) reports

> Collections since this copper was described reveals material from Kernville, the east side of the Greenhorn Mountains and the Kern River Valley is a gorgon-micropunctata blend zone closer to this subspecies. Collected material from the Kelso Valley region (including east of Sageland), Butterbredt Peak, Walker Pass and the Lamont Peak area is this subspecies. Blending with nominate gorgon also occurs in the upper Kern River Canyon-Johnsondale region and lower Sherman Pass Rd. east of the Kern River.

Sequoia National Forest Rationale

The species is common in its habitat. The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Davenport, K. 2014. Butterflies of North America 3.4 Butterflies of Kern and Tulare Counties, California. Annotated Checklist of Butterflies of Kern and Tulare Counties, California; *Field Collecting and Sight Records for Butterflies of Kern and Tulare Counties, California;*Butterflies of Sequoia and Kings Canyon National Parks, Tulare and Fresno Counties, California Contributions of the C.P. Gillette Museum of Arthropod Diversity Colorado State University.

Davenport, K. 2018. Lepidoptera of North America 15, Butterflies of southern California in 2018: updating Emmel and Emmel's 1973 Butterflies of southern California. Contributions of the C.P. Gillette Museum of Arthropod Diversity Colorado State University. 175 pp.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

USDA Forest Service. 2015. Butterfly reference document for Inyo, Sequoia, & Sierra National Forest – USFS R5, June 29, 2015. Unpublished report. USDA Forest Service, Pacific Southwest Region. 58 p.

Aquatic Invertebrates

A caddisfly - *Anagapetus chandleri*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Sequoia National Forest Rationale

There are no known locations of this species in the plan area (BISON 2018). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Biodiveristy Information Serving Our Nation (BISON) database. 2017. www.BISON.usgs.gov. Accessed 13 June 2018.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A caddisfly - *Glossosoma mereca*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G3

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Sequoia National Forest Rationale

There are no known locations of this species in the plan area (BISON 2018). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Biodiveristy Information Serving Our Nation (BISON) database. 2017. www.BISON.usgs.gov. Accessed 13 June 2018.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].

A caddisfly - *Homophylax nevadensis*

Is there sufficient scientific information available to determine if there is substantial concern about the species' capability to persist over the long term in the plan area? Insufficient

Does the best available science indicate substantial concern about the species' capability to persist over the long term in the plan area? No

Proposed Species of Conservation Concern

No

Relevant Threats to Species

Habitat modification, water quality degradation, and climate change.

Rationale for Species

NatureServe Global Rank: G2G4

NatureServe T Rank: None

State Rank: SNR

Other Designations: None

Sequoia National Forest Rationale

There one recorded occurrence in the Monache Meadows area on the Inyo National Forest, but there are no known locations of this species in Sequoia National Forest the plan area (BISON 2018). The best available scientific information about the species does not indicate substantial concern about the species' capability to persist over the long term in the plan area. Based upon the evidence and supporting best available science, this species does not meet the established criteria at CFR 1909.12 chp. 10, 12.52 (c-d) as a species of conservation concern in the plan area.

Best Available Scientific Information Considered

Biodiveristy Information Serving Our Nation (BISON) database. 2017. www.BISON.usgs.gov. Accessed 13 June 2018.

California Department of Fish and Wildlife, Natural Diversity Database. April 2017. Special animals list. Periodic publication. 51 pp.

California Natural Diversity Database (CNDDB). California Department of Fish and Game, Biogeographic Data Branch. 2017. California Natural Diversity Database. Sacramento, CA. Data downloaded April 2017.

Natureserve. 2017. NatureServe Explorer. Arlington, VA. U.S.A. Available at: http://explorer.natureserve.org/ [accessed 31 March 2017].